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The
GEOGRAPHICAL JOURNAL

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THE PRESIDENTIAL ADDRESS

THE RIGHT HONOURABLE LORD NATHAN

LOOKING BACK over my three years in office, which today come to an end, I think of our activities as falling under three main heads: research, information and exploration. I will start with research. We have been able to foster new research in several ways. With aid from the Marc Fitch Fund we established last year an R.G.S. Research Fellowship in the geography of the Roman Fenland. Dr. Peter Salway, Fellow of Sidney Sussex College, Cambridge, has since been appointed to this post and he is at this moment at work in the field. Another very promising development has been the support of research in the geographical distribution of disease. This is due to our Medical Geography Committee of which I am myself the Chairman. Last autumn, fortunately, we obtained a grant of £500 a year for four years from the Wolfson Foundation in support of research for our Medical Geography Committee, undertaken by Dr. G. Melvyn Howe of the University College of Wales. This, I hope, will lead to the publication of a National Atlas showing the distribution of certain key types of disease, such as cancer, and lead also to a study of the geographical factors which appear likely to influence their growth. Our Research Committee, meanwhile, under the chairmanship of our Vice-President, Professor Dudley Stamp, has been active in studying ways in which geographical work in this country, in our universities and elsewhere, can best be coordinated to assist the national research effort.

With research I will group publications. Following our recent Memoirs on *The making of the Broads* and *Norwegian cirque glaciers* and our edition of the fourteenth century Gough Map, we published last month a very attractive facsimile atlas showing the evolution of the Map of Britain from the earliest times to the sixteenth century. Mr. Crone, our Librarian and Map Curator, has provided a scholarly preface. No account of our research publications could be complete without a reference to our *Geographical Journal*, which now has a circulation of over 9000 copies. It was clear to me at the XIXth International Geographical Congress at Stockholm last summer, which I and Mr. Kirwan attended, that our *Journal* has a very high reputation throughout the world. For this, much credit is due to our editorial staff. In particular I must mention the Editor, Mr. L. P. Kirwan, Director and Secretary of the Society, our able Assistant Editor, Mrs. Middleton, and our Publications Committee under our Honorary Secretary, Dr. Hindle.

Now for the information side of our activities. First, our Library and Map Room, which is the responsibility of our Library and Maps Committee, under Sir Christopher Summerhayes: here grants from the Pilgrim Trust have enabled us almost to complete a recataloguing on modern lines of all holdings up to 1910. This year also sees the publication of the first hand-list of our remarkable collection of 600 current

geographical periodicals. We shall, moreover, by the end of the year, have completed the first proper collation and indexing of our archives up to 1920. These are already throwing new light on British exploration and on the expansion of British territory overseas in the nineteenth century. Our map collections have continued to grow. Over the last three years we have added to them no less than 42,000 new sheets of maps. As in the past our Map Room, open to the public, has been continually used by government departments and by Industry.

Our evening Lectures and our afternoon Film meetings have been remarkably successful during the past year. So also have our exhibitions. One, "Exploring the sea bed", was arranged by the Hydrographic Department of the Admiralty at Christmas. Then, in February, in cooperation with the Royal Danish Embassy, we staged a special public exhibition on Greenland. This was honoured by a visit from Her Royal Highness Princess Margarethe of Denmark. Even where our exhibitions have not been open to the general public, they have always been open to schools. During the past three years our exhibitions have been seen by over 30,000 people. Of these 9000 have been school-children.

I now turn to what I, like the majority of our Fellows and, indeed, the general public also, regard as the most important part of our activities. That is our support of exploration. I have, as you know, been an enthusiastic advocate of exploration by the youth of this country and the Commonwealth, and of the extension of our support beyond undergraduates to young people of school age and to apprentices from Industry. Here there have been several new developments. We have awarded this year four bursaries to selected boys who are to travel in the Scandinavian Arctic under the aegis of the British Schools Exploring Society. We have also given grants to several expeditions containing apprentices and trainees from Industry. Another new departure this year has been our first grant to an all-African students' expedition from Makerere College, Uganda. Of the one hundred or more expeditions which we have supported during my three years in office, fifty-five belong to this year's list. Such a great expansion of support inevitably costs money. It has only been possible through a generous donation from the Wolfson Foundation of £2500 a year to be spent over four years. Help has also come from the Calouste Gulbenkian Foundation in the form of a third grant for the purchase of photographic equipment for expeditions. The Mount Everest Foundation, in which we are partners with the Alpine Club, has also given us a very welcome grant of £1750 for surveying instruments. These expanding expedition activities have, of course, involved more work for our Expeditions Committee under the experienced chairmanship of our Vice-President, Professor J. A. Steers. They have, too, because nearly all expeditions these days undertake surveying, considerably added to the task of our invaluable and highly expert consultant in surveying, Mr. Alfred Stephenson.

I would now like to say a word or two about finance, and about bequests which have fortunately come at a time when the Society is hard pressed to maintain a balanced budget. Last year I recorded the great debt we owed to the late Mrs. Ursula Lloyd. This year I must record our debt to the late Miss Annie J. Wright, a Fellow for many years and a practising teacher of geography, for a generous bequest of some £7000. Facing as we do a further substantial deficit in 1961, such bequests are doubly welcome. I wish there were more to help us not only to carry on, but to expand, our work of exploration and research. In the long run, of course, we can never depend on "windfalls" like these. The basis of all our calculations, indeed of our very existence, must remain the subscriptions of our Fellows and Members. Here we have continued to gain ground; and our membership of all kinds stands today at 7177. This is a record figure. It represents an over-all increase of 540 over the

past three years. But more Fellows of suitable calibre are needed; and here I would remind you that not only geographical specialists are welcomed to our Society, but also interested laymen. Indeed, of our present membership less than thirty per cent. are professional geographers. In speaking of membership, I must in particular mention our 43 Corporate Members whose continued support is so very valuable to us.

It is customary in these annual addresses to refer to our contacts with sister societies and to visits of members of our Council and staff abroad. Last month, following earlier visits to the Geographical Societies of Rome and New York, I visited the Royal Netherlands Geographical Society and delivered an address on the history and activities of the R.G.S. During the past year, Sir James Marshall-Cornwall represented the Society at the quincentenary celebrations in Lisbon of Prince Henry the Navigator. These were also attended by Mr. Crone, our Librarian and Map Curator. Mr. Kirwan, our Director, returned during the winter to his customary hunting ground, the Sudan, for archaeological work with the Sudan Antiquities Service in connection with the flooding of the temples and other antiquities of Nubia by the High Dam at Aswan.

I must now say a word of the future. There can be no question about the value or the magnitude of the geographical work which we still have to do, especially in the field of exploration. We now live in the Space Age. Nevertheless much of the Earth's surface still remains—in the scientific sense—unknown. But more work requires more money. Here, like many other scientific societies, we are at a disadvantage in conditions of today. We are by constitution a private society, supported by our Fellows and Members. But we have also become, over the years, a national institution with public obligations, yet with a quite inadequate subvention from public funds. As regards our scientific future, I have no anxieties. That should be plain from the record of our achievements to which you have listened today. Our financial future is a very different matter. Our membership has much increased. But costs have risen even faster. At a time especially when the payment of rates is likely to be added to the many other financial anxieties afflicting learned societies, finance must be your Council's immediate concern.

I cannot conclude this address without paying tribute to the officers, Council and staff of the Society. First, Sir James Marshall-Cornwall, my immediate predecessor in office, whose wise advice has been invaluable to me during my presidency and I am happy to announce that on his retirement from the Council today he will become an Honorary Vice-President. I am also happy to announce that your Council has nominated as Honorary Vice-President, the Lord Bishop of Norwich, Trustee and former Vice-President, who has added lustre to our gatherings over many years. Dr. Edward Hindle, Honorary Secretary for the past ten years, also retires today from the Council. A devoted officer, his profound scientific knowledge, recognized in his Fellowship of the Royal Society, has been of the greatest value to us. Dr. Hindle has had as his fellow Honorary Secretary Dr. Briault, who has also been the chairman and leading spirit of our progressive Education Committee, which has done much excellent work. To him also I am indebted, as well as to our Honorary Foreign Secretary, General Brown, who is chairman of our very active Survey and Instruments Committee, which is so closely involved with exploration. Our Treasurer, Mr. Pirie-Gordon, has been only a year in office. But he has already, and most effectively, reorganized our finances. We are most fortunate to have him in this key post. To these and other members of our Council I owe a deep debt of gratitude.

Finally, I must record my gratitude to the staff of all branches and of all grades. It would be hard to find a more loyal, energetic and devoted staff, or one more wholeheartedly dedicated to the well-being of our Society. The whole staff is fortunate to

have as their leader the Director and Secretary Mr. L. P. Kirwan, and I, as President, have been fortunate in having him by my side these past three years. He has fulfilled his role ungrudgingly and altogether admirably. I cannot be sufficiently grateful and welcome this opportunity of acknowledging publicly my indebtedness to him, and of thus recording my high regard for the qualities of intellect, scholarliness and character which he has held at my disposal and of his unswerving devotion to our Society. Your Royal Highness, that completes my story. In vacating the Presidency this afternoon, after three years in office, I shall have these thoughts uppermost in my mind: that in its task of advancing geographical science, the Society will, I am confident, more than fulfil the dreams of its founders; and that in fulfilling its mission of stimulating adventurous endeavour through exploration, it will bring credit not only to itself but to the whole nation.

H.R.H. Princess Marina, Duchess of Kent, presenting the Patron's Medal to Dr. Mikhail M. Somov, 19 June 1961

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THE ARGUMENT FOR THE ENGLISH DISCOVERY OF AMERICA BETWEEN 1480 AND 1494

DAVID B. QUINN

I

IN 1956 DR. LOUIS ANDRÉ VIGNERAS published a letter he had found in the archives at Simancas which has greatly affected and will continue to affect consideration of the circumstances of the discovery of America (Vigneras, 1956, pp. 507–9; 1957, pp. 226–8; Almagià, 1960, pp. 507–9). In Spanish, and undated, the letter was addressed by John Day, an Englishman, to a Spanish official, the "Almirante Mayor", who is to be identified either as Fadrique Enriquez, Grand Admiral of Castile, or as Christopher Columbus, Admiral of the Ocean Sea, often referred to also as the "Almirante Mayor". Dr. Vigneras prefers the Columbus identification and it seems the much more probable one. The letter is the work of a man of some learning, familiar with the geographical knowledge of the time, who has been carrying on a correspondence with the Grand Admiral, exchanging books with him, and sending him information on English voyages on at least one earlier occasion. Where its information can be checked against other evidence it is correct, which suggests that its unsupported statements are serious and probably authoritative ones. The letter is mainly concerned with reporting a successful voyage from Bristol by an unnamed explorer which has found across the ocean a land which Day identifies with "the Island of the Seven Cities". Both by its general character and by specific details—the grant, for example (on 13 December 1497) of a pension of twenty pounds by the king to the explorer on his return (Williamson, 1929, p. 33)—this voyage can be clearly and unambiguously identified as that made by John Cabot in 1497 during which he coasted a substantial part of the Newfoundland and mainland shores across the Atlantic. The letter, moreover, states that the explorer had earlier made an unsuccessful voyage from Bristol, thus adding a piece of hitherto unknown information on John Cabot, while it also gives some details of the preparation for a further voyage which Cabot was making to follow up his discovery. From this last information it is possible to tie down the composition of the letter to the latter part of December 1497 or the opening month or so of 1498. The general considerations are discussed by Dr. Vigneras (1956, pp. 503–6). For the Cabot voyages the letter is an important source, the most important, indeed, to be published in the present century, while the details it gives of the 1497 discoveries will continue to provide material for interpretation and controversy. One passage in it goes beyond the Cabot voyages themselves and raises the question of the priority of the discovery of America in a novel form. Its interest is such that it is worth segregating it from the Cabot material and considering what its implications may be if it is taken literally as a statement of fact.

The text reads, in translation: "It is considered certain that the cape of the said land [that found by Cabot in the 1497 voyage] was found and discovered in other times by the men of Bristol who found 'Brasil' as your Lordship knows. It was called the Ysle of Brasil and it is assumed and believed to be the mainland that the Bristol men found." (The Spanish being: "Se presume cierto averse fallado e descubierto en otros tiempos el cabo de la dicha tierra por los de Bristol que fallaron el Brasil como

dello tiene noticia Vra Sª la qual se dezia la Ysle de Brasil e presumese e creese ser tierra firme la que fallaron los de Bristol.") (Archivo General de Simancas, Estado de Castilla, leg. 2, fo. 6.) The Spanish of the letter shows few signs of being written by a foreigner, but Dr. Vigneras has found that John Day, its author, as an English merchant, appears also in a Spanish document of 1500 (Congresso Internacional de História dos Descobrimentos, *Resumo das Comunicações*, Lisbon, 1960, p. 92). The literal meaning is clear enough. The land, or part of the land, which Cabot found in 1497 is equated with "Brasil" or the "Isle of Brasil", which the Bristol men had found already some time before. Cabot's discovery, although the possibility of a rediscovery of land found and lost again is not ruled out, had not, Day is asserting, any claim to absolute priority. When, then, could this first discovery have taken place? Or between what limits can we place it? The major ambiguity lies in the words, "en otros tiempos", with which Dr. Vigneras has already wrestled (1957, pp. 224–5). The expression is a vague one, "in times past", rather than "in past times", having only the implication that the "times" were not very recently passed, but even that not very clearly. Certain dates, 1480, 1481, 1490 give us a framework of known facts in which to insert a series of questions and an argument on the implications of the statement.

1. Could the discovery have taken place before 1480? Clearly it could have done so, but no evidence whatever of specific English voyages of discovery into the Atlantic before that date has yet come to light. That being so, nothing useful can be said except that the first positive evidence we have, that for 1480, which follows, is slightly weighted against a discovery before that date, and that for 1481 more heavily.

2. On 15 July 1480 a ship, partly owned by John Jay the younger and with "Thloyde" (identified as John Lloyd with some probability, though it could be Thomas Lloyd) as master, left Bristol for the Island of Brasil, west of Ireland, and returned by September 18 following, having through bad weather failed to find the island. The Latin of William Worcester on its objective reads: "usque ad insulam de Brasylle in occidentali parte Hibernie" (transcribed from the Itinerary of William Worcester, Corpus Christi College, Cambridge, MS 210, p. 195, in Carus-Wilson, 1937, no. 205; translated in Williamson, 1929, pp. 18–19). Since the Island of Brasil appeared on many maps, in many different locations, from 1325 onwards, without apparently having been discovered in practice, this would appear on our present information to have been an unsuccessful voyage of discovery to an island known only in theory. Nevertheless, the alternative, that it was an unsuccessful voyage to an island or land already known and discovered before 1480, cannot be entirely ruled out. At least, however, the discovery did not take place in 1480 as the result of this expedition.

3. On, or shortly after, 6 July 1481 two ships, the *George* and the *Trinity* of Bristol, partly owned and victualled by Thomas Croft, one of the collectors of custom for Bristol, left the port "to serch & fynde a certain Isle called the Isle of Brasile".[1] The terms of their objective would, more strongly than the document of 1480, indicate that the Isle of Brasil had not been located and that this was another voyage of discovery. Moreover, on 18 June 1480, probably too late to be connected

[1] Three versions of proceedings relative to Croft's participation in the venture survive in the Public Record Office (Exch.K.R. Customs Accounts, 19/16; Exch.K.R. Memoranda Roll, 22 Edward IV, Hilary m.30; Exch.L.T.R. Memoranda Roll, 22 Edward IV, Hilary m.10), but all contain only the one phrase relating to the purpose of the voyage and give the same information about the ships and Croft's participation in the venture: Harrison, 1930, pp. 198–9 (associating it with the 1480 evidence); Quinn, 1934, pp. 280–1; Carus-Wilson, 1937, pp. 157–65 (the fullest presentation of the material).

with the 1480 voyage, a licence was given to Croft and three Bristol merchants, William Spenser, Robert Straunge and William de la Fount, to trade for three years to any parts, with any goods except staple goods, despite any statute to the contrary, with two or three ships, each of sixty tons or less.[1] Since Croft was precluded by his office from engaging in trade and was questioned on 24 September 1481 about shipping forty bushels of salt in the *George* and *Trinity* on 6 July 1481, it would appear that this licence was for exploration, not commerce, while Croft's excuse that the two ships which he had helped to victual were intended not for commerce but for the search for the Isle of Brasil, was accepted. The 1481 voyage, of the failure of which there is no record, and of the return of which the proceedings against Croft are probably circumstantial evidence, is one which could have resulted in the English discovery of America. A discovery by this expedition would fit, without straining, the requirements of John Day's letter. Moreover, it is the earliest known voyage which could have so succeeded. 1481 is therefore the earlier limit on our present information for a successful discovery and could be the year of the discovery itself.

4. If the discovery did not take place in 1481, Croft and his partners, provided the licence of 1480 was for the purpose which has been presumed, had still authority to set out ships in 1482 and in 1483 up to June 17. Evidence is still entirely lacking that any such further voyages were made or, if made, that they had any results, but it is within the years of the currency of the licence that the English discovery of America is least unlikely to lie.

5. The years between 1483 and 1490 are as blank of even the suggestion of evidence for a voyage as those before 1480, but they are still within the period of discovery appropriate to the Day letter.

6. One of the Spanish representatives in England provides a well-known piece of evidence about English western voyages which reaches back, perhaps, to 1490. Pedro de Ayala wrote from London to Ferdinand and Isabella on 25 July 1498 to report on Cabot's discoveries in 1497 and on the progress, so far, of his 1498 expedition. He added: "Los de Bristol ha siete años que cada año an armado dos, tres, quatro caravelas para ir a buscar la isla del Brasil, i la Siete Ciudades con la fantasia deste Ginoves", which has, since 1862, been invariably translated: "For the last seven years the people of Bristol have equipped two, three, four caravels to go in search of the island of Brazil and the Seven Cities according to the fancy of this Genoese". (*Calendar of State Papers, Spanish, 1485–1509*, 1862, p. 177; Williamson, 1929, p. 39 (English translation); Biggar, 1913, pp. 27–9 (Spanish).) It is not certain which years are meant. Is Ayala writing of seven years before Cabot's voyage of 1497 or of seven years before his letter? The range is either 1490 to 1496 or 1491 to 1497, and choice between the alternatives is not easy to make; both must be regarded as possible. How far Ayala was speaking precisely and authoritatively it is also impossible to say, but it is reasonable to take his statement at its face value that a series of Bristol voyages began in 1490 or 1491 and was continued in, perhaps, each of the six years following.

To determine how much or how little John Cabot had to do with these voyages is a delicate matter. "According to the fancy of this Genoese" has been taken, almost

[1] Calendared from P.R.O. Treaty Rolls, 164, m.10 (in Carus-Wilson, 1937, no. 209). Professor Carus-Wilson thought that the men named in it "were perhaps responsible for the venture in the following month, as well as for that of 1481" (p. 204). Evidence for this is still to seek, but it is at least unlikely that the 1480 expedition depended on this grant for authorization, since preparations would have been too far advanced to make it possible to bring them to fruition so soon. What it does prove is that an outbreak of activity in overseas voyaging occurred at Bristol in 1480–1, the precise stimulant to which has not been discovered.

invariably, to mean that John Cabot, Genoese by origin though Venetian by adoption, inspired this series of Bristol voyages and proposed their objectives to those who took part in them. This does not necessarily follow. The phrase as it stands can mean simply that in Cabot's "fancy" the objectives of the Bristol voyages were the Isle of Brasil and the Seven Cities. He would stand outside the voyages entirely and his comment would be that of an observer only, made to Ayala's informant near to the time of writing in 1498. An alternative translation of the passage could read: "The Bristol men for seven years have fitted out yearly two, three, or four small ships to go in search, as this Genoese fancies, of the Isle of Brasil or the Seven Cities." Which interpretation is correct must remain a matter for argument. Each appears to be legitimate.[1]

The alternative interpretation fits usefully into a pattern formed by the newer documents. It is in line with the evidence already used on the 1480 and 1481 voyages. The English are continuing in the 'nineties their westward voyages from Bristol, only now they are using as many as three or four little ships instead of one or two; they are said to be looking for the Seven Cities in addition to their old objective the Isle of Brasil. Moreover, the evidence found by Professor M. Ballesteros Gabrois in the Aragonese archives, if it is to be accepted, puts John Cabot in Valencia between the middle of 1490 and the end of February 1493 at least, and so rules him out from influencing some of the earlier voyages of the series. This involves identifying the Juan Caboto Montecalunya, a Venetian engaged on harbour works at Valencia, with the "English" John Cabot. While this is not certain it is highly probable (Ballesteros Gabrois, 1943, 1952). The discoveries of R. Gallo (1948) on the "English" John Cabot's activities in Venice between 1476 and 1485 make it unlikely that there was a second John Cabot with Venetian nationality, though the cognomen "Montecalunya" remains mysterious. The consequence of accepting this identification would be that the voyages of 1490 (if there was one), 1491, 1492 and 1493 (probably), of the series were purely English expeditions, and so they could be considered as coming within the range of the independent English discovery described by John Day. Dates as late as 1490 and 1491 could be covered by his "en otros tiempos"; later dates, 1492, six years, and 1493, five years, before the Day letter, seem too near, or at least to be at the outer limit of credibility: 1494, if worth considering, would be rather absurd. We are entitled to say, remembering that we have selected one meaning of two from the Ayala letter and have accepted the Valencia material, that 1490 and 1491 come within the probable range of the independent English discovery of America, and 1492 and 1493 within the possible limits.

7. Robert Thorne the younger, in 1527, claimed that his father, Robert Thorne the elder, and Hugh Eliot, merchants of Bristol, were "discoverers of the New Found Landes" (Williamson, 1929, p. 13). The claim appears to have been made in good faith and, accepting Day's statement of a pre-Cabotan English discovery, it seems not unlikely to be true, or at least to indicate that these men had something to do with a voyage to the Isle of Brasil before Cabot came on the scene. No date is associated with the claim, but John Dee in 1580 (Williamson, 1929, p. 12) adopted it and associated it with the date 1494, doing so only tentatively, placing it

[1] Professor A. E. Sloman, School of Hispanic Studies, University of Liverpool, confirms this. "Fantasia", with the meaning of fantasy, fancy, imagination, also carried a nautical meaning—reckoning, or estimation, of direction or distances (A. Jal, *Glossaire nautique* (Paris 1848) s. vv. *Fantasia, Estime*), which would give a meaning to the ambiguous phrase of "according to the reckoning of this Genoese", which would favour the second explanation, but no example of the use of this meaning in the fifteenth century has been found.

"Circa An. 1494", and leaving no evidence to show whether or not he had specific reasons for the choice of date. "1494" therefore has no special authority: a Thorne-Eliot voyage before 1494 which had a successful outcome is as possible as one in that year if not more so. 1494 can, however, be dragged in as the furthest forward limit of the discovery recorded by John Day and, as already indicated, it is already so late that it can legitimately be thought of as beyond the limit.

8. John Cabot, if he still had unfinished business at Valencia at the end of February 1493, is unlikely to have come to England in time to take part in westward voyages from Bristol before the end of the sailing season (September) in that year. 1494 is therefore the first year in which he, if the Valencia evidence be accepted, is likely to have been available to make a voyage from Bristol. John Day records that he did make one unsuccessful voyage before 1497. On the arguments advanced so far this would leave 1494, 1495 and 1496 open to him for it. It is difficult to say with any confidence that one year is much more probable than another. The first is still a possible Thorne-Eliot year and is therefore a shade less likely for a Cabot voyage. Dr. Vigneras argues that Cabot would not have made a voyage until he had got a royal licence to do so and so could not have made his first, unsuccessful voyage until 1496 (Vigneras, 1957, p. 222). This is reasonable but it does not exclude alternative suppositions. If Cabot intruded himself at Bristol he may have found himself handicapped by secrecy and obstruction so that his first venture had little chance of success and he may therefore have sought a royal licence so that he could overcome it. This is pure speculation, but it is made to show that Cabot could have made his first voyage in, for example, 1495. If 1496 is regarded as more likely, however, following on Cabot's petition to Henry VII and the issue of a patent on March 5 granting him powers to occupy and govern lands found, and to trade with them through the port of Bristol (Williamson, 1929, p. 31), a further point remains. In that case Bristol voyages made in 1495 as well as in 1494, in Ayala's series, would have been purely English voyages. The limiting date of an English discovery could therefore be pushed up to the very eve of the Cabot grant but, if it is, John Day's "in other times" must be called in question because if 1494 is an absurd date to associate with it, 1495 is impossible. A run of annual Bristol voyages, beginning about 1490 and continuing to include 1495, though not including a discovery in the later years, seems credible. The series would then be continued or paralleled by an unsuccessful Cabot voyage in 1496.

9. In summary, then, since, according to John Day, the English discovered America before 1497 they must have done so either before 1480 or between 1481 and, at the furthest limit forward, 1494. 1481 or a date near it would best fit the phraseology of the Day letter on the information now available. A date of 1490 or 1491 is still possible though less likely, but it seems desirable to bring in at least one of the years covered by Ayala's evidence. A date between 1492 and 1494 appears progressively less acceptable and 1495 unacceptable (though of course the drawing of a line in this case must be at least partly subjective). Allowing ourselves room for speculation on years both before and after, we can say that an argument on the present basis indicates that the English discovery could reasonably have taken place between 1481 and 1491, with the initial date, 1481, and the concluding one, 1491 (if it is the first of Ayala's series), as slightly less unlikely than the others, though with the chances otherwise in favour of a year in the early part of the series rather than the later. Further than this it would seem undesirable to go until something fresh can be adduced. The sequence of information is so fragile and incomplete that any single scrap of new evidence can upset it. It does not provide a basis for any dogmatic statement other than that made by John Day himself. Nevertheless, with

all its limitations, it does provide a rational case for placing the English discovery of America in the decade before Columbus sailed in 1492, and possibly as early as 1481.

II

In what was said above, the possible implications of one statement only in the Day letter was followed. But with that done it may be worth considering what kind of speculation may seem appropriate to the information which can be squeezed out of this statement. The main and obvious point is that we should ask what kind of a discovery was it that remained so little remarked before Cabot's patent brought the search for land in the west into the open. The descriptions in the documents of 1480 and 1481, in the Day letter and in Ayala's, mention the insular character of Brasil and the last two of them of the Seven Cities as well, though John Day also indicates each island, after the Cabot voyage of 1497, as a mainland ("tierra firma") as well. The insular nomenclature is in accordance with the appearance of these names as denoting islands in the cartographic record, into which it is not proposed to enter, except to emphasize that charts of the fourteenth and fifteenth centuries do not give stable locations for Brasil and seldom specify the Seven Cities as such (Cortesão, 1954, pp. 68–74), and so cannot be convincingly tied to discoveries. But whatever the English discovery was, in fact, the old insular name (or names) was applied to it. A discovery of the Isle of Brasil by the English between 1481 and 1491 would lead us to expect some publicity, or else some attempt to exploit the discovery by further voyages of exploration, but until 1956 no unambiguous statement of even an initial discovery had come to light. The implications of this appear to be twofold; either there was a discovery, which was quickly lost sight of and which subsequent searchers failed to disclose until 1497, or the discovery, when made, was valued only as incidental to some other purpose or objective. The first is possible; navigation in northern waters at this time was anything but accurate. Yet Day's statement does not easily admit of such an interpretation. The alternative seems rather more attractive in view of the later history of the waters between lat. 45° and 50° N. off the North American continent. Fishing was contemplated in 1481, as can be clearly seen from the amount of salt shipped (Carus-Wilson, 1937, no. 209); the discovery of land, believed to be an island, at Newfoundland or even Cape Breton, would attract attention and interest primarily as a landmark for fishermen intending to operate on the Banks nearby. The history of the Newfoundland fishery, from the time it emerges in the early sixteenth century, demonstrates how incidental and casual was the attention of the fishermen of four nations to the land which bordered the fishing grounds. Speculation about the English-found Isle of Brasil which regards it as likely to be a territorial key to a fishery on the Banks and valued primarily as such, may well be fruitful. This could explain the lack of publicity about the land, if it was not thought to be of great importance in itself. Moreover, the silence about the fishery, the lack of publicity about the discovery of new and extremely rich grounds, would be entirely intelligible and could be supported by analogies from the sixteenth century. Bristol merchants and fishermen would not wish to have even their countrymen, let alone foreigners, as their competitors. But, given this possibility, the yearly expeditions of "discovery" mentioned by Ayala from 1490 (or 1491) would look, instead, like annual fishing fleets on their way to and from Newfoundland waters. If the English discovery can be pushed back into the period 1481–91, as it can if the argument above is reasonable, then so, it is likely, can the history of the English Newfoundland fishery, always supposing that the Isle of Brasil was not found and lost again, but was used mainly, perhaps solely, as a landmark for the fishing grounds.

The intrusion of John Cabot into the sequence of westward English voyages becomes more difficult to explain now that the Day letter gives a clear statement that there was an earlier English discovery. Before it appeared John Cabot could be seen as the expert Italian navigator who came to Bristol to teach the local seamen how to cross the Atlantic and succeeded in doing so after they themselves had failed. But if they had already succeeded why should they permit him to intervene, or, when the patent had been issued giving him rights to rule lands found, associate themselves with him? The answer, if the land first found had been rapidly lost again, might well remain the traditional one, but if the Isle of Brasil continued to be known and to be used to mark a fishery the difficulty is a real one. Cabot is unlikely to have got his patent or to have been able to operate from Bristol from 1496 onwards without having something new to offer.

In trying to answer what John Cabot may have had to offer, speculation can, at least, state probabilities rather than possibilities. Cabot, like Columbus, Ayala said in 1498, had been in Lisbon and in Seville seeking support for his plans for exploration. This would have been either before 1490, probably after his journey to Mecca of which Soncino wrote in 1497 (Williamson, 1929, p. 31), or in intervals during the period when he was mainly engaged in Valencia in planning harbour works, if he is indeed Juan Caboto Montecalunya, from 1490 to 1493. It is less likely that he should have begun to press for support in either Spain or Portugal for his own plans after Columbus had returned, as he would know in 1493, triumphant in his belief that his island discoveries lay just off the shores of Asia. For the nature of these plans we have no documentary evidence prior to the 1497 voyage, but it is highly probable that they were similar to those of Columbus, a westward passage to Cathay and the rest of Asia on a sea route thought to be shorter than it actually was. The reports of Cabot's discoveries in 1497 (Williamson, 1929, pp. 29, 31), leave little doubt that he believed he had found a way to Asia. His departure from the Iberian peninsula in 1493 or 1494 for England in pursuit of his plans would therefore fit in with a belief that he could still compete with Columbus in the exploitation of his route to Asia by an approach from a somewhat different direction.

To pursue this film of speculation it is now necessary to presume the leakage of news of a Bristol discovery of the Isle of Brasil to either Portugal or Spain. Trading contacts make it possible. The need for Cabot to have some specific incentive to come to England makes it, perhaps, probable. We have John Day's statement to the Grand Admiral, who is likely to be Columbus himself, that the English had discovered the land found by Cabot in times past "as your Lordship knows". This could mean recent knowledge on Columbus's part, imparted to him perhaps by Day not long before the surviving letter, but it could also mean knowledge which had been in his possession for some years, conceivably at the same time as John Cabot could have obtained it. If it was circulating as a story in Lisbon or Seville it is as likely that one would have heard it as another. All that is necessary here is to permit the inclusion of a leakage about the English discovery into the possible sequence which brought Cabot to England.

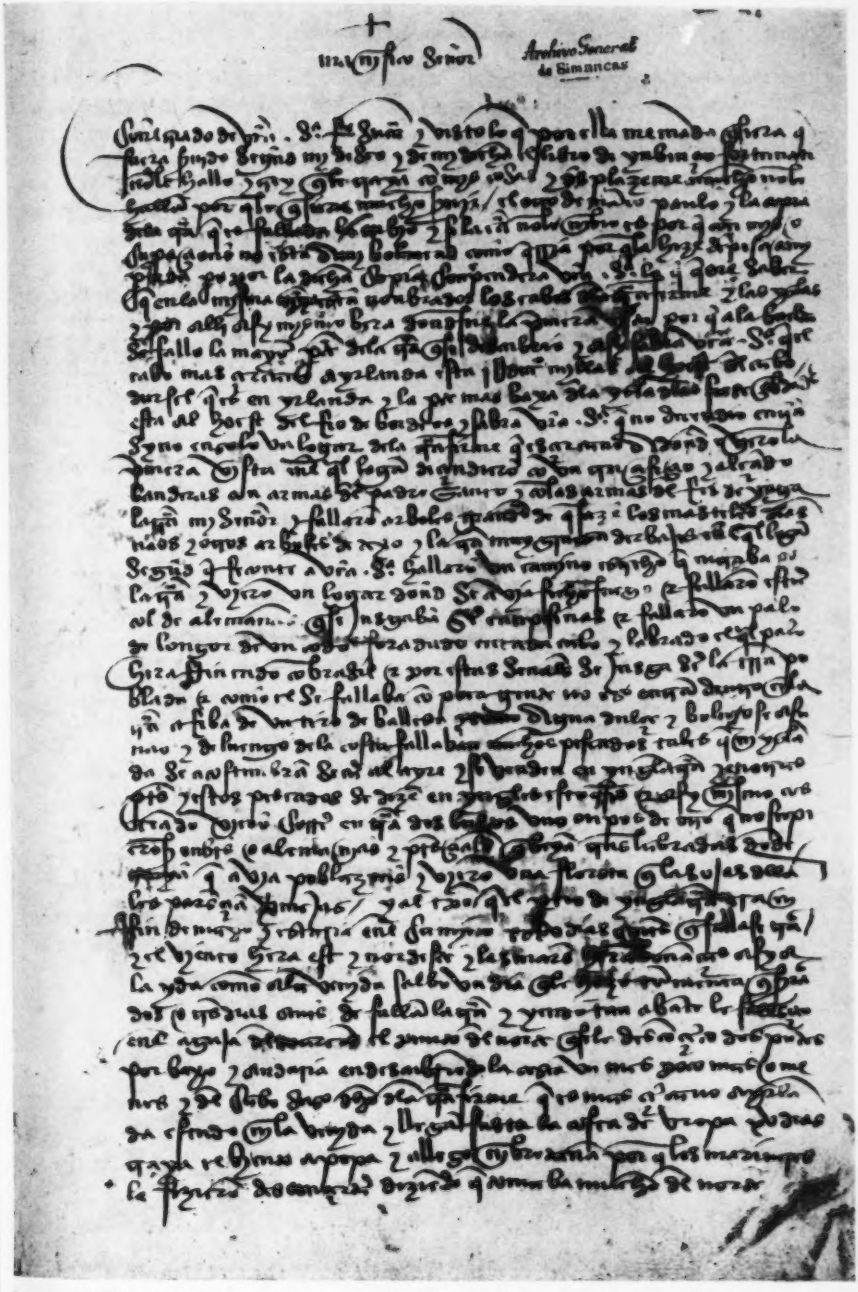
With this kind of background, John Cabot's appearance at Bristol would seem logical. He would be able to point to the success of the Columbus voyage of 1492, although he could well have expressed some scepticism as to whether the islands found were so near the Asiatic mainland as Columbus claimed; he could propose to use the Isle of Brasil as a half-way house to a more northerly part of the Asiatic coast, with a still shorter sea passage than that followed by Columbus, so as to tap the commerce of Cathay and the Spice Islands. It could have taken him several years to establish himself in Bristol and the suggestions already made that he might have had

to overcome secrecy and even obstruction in his plans and in his initial voyage would remain relevant, but his success in getting the backing of Bristol merchants and of Henry VII would rest on convincing them that he could exploit the earlier discovery as a major trading route across the ocean, thus overlaying fishing by commerce. He came back from the 1497 voyage convinced that he had found the land of the Great Khan and that a further penetration down the coast of Asia would bring him to Marco Polo's Cipango (Williamson, 1929, pp. 29, 31). He also revealed the existence of vast quantities of fish in the American waters through which he sailed, thus publicizing perhaps, rather than discovering, the Banks. It should be remarked that his patent of 1496 gave him rights over lands hitherto unknown to Christian peoples (Williamson, 1929, p. 26). This would not strictly give him any rights over the Isle of Brasil as previously found; that would still, if the speculations above prove to have any foundation, remain in the charge of its discoverers if they cared to assert rights to it or continued to use it to mark the approach to a fishery or as a shore base of any sort. The patent of 1496 (and indeed those of 1501 and 1502 to other grantees which followed (Williamson, 1929, pp. 46–66)) made no mention whatever of a fishery. If it had been established before 1497, on the basis of the discovery of the Isle of Brasil, it presumably would continue as before, separate from and independent of, the expeditions to search for a route to Asia or for other lands along that route, such as the island and mainland of the Seven Cities which Day thought Cabot had found. A prior English discovery of land to the west, which was not publicized before or after 1497, though information about it could have leaked out at some stage before 1497, would provide the basis for an English claim to a footing across the Atlantic anterior to and separate from Cabot's discoveries. Finally, if the leakage by which it is suggested John Cabot learnt of the English discovery of the Isle of Brasil reached Christopher Columbus before he sailed to America in 1492, and he was well aware of it, in John Day's terms, so long before the Day letter was written, then the English discovery could have been one of the more significant pieces of information which led Columbus across the Atlantic with the conviction that there was land to be found within the range of distances which he anticipated. The Isle of Brasil as found by the English can therefore join the tales by the Unknown Pilot and the traditions of the Vinland voyages amongst the data which Columbus could have had at his departure.[1] Though the Day reference is suggestive, rather than conclusive, it is more specific than other indications of knowledge of pre-Columbian voyages at the disposal of the discoverer in 1492 and may therefore find a place in the Columbus story.

III

It should, in conclusion, be emphasized that the two parts of this short paper ought to be sharply differentiated. The first part is merely a common sense attempt to see where an argument from known evidence can lead. The second is a purely speculative reconstruction, novel only in its attempt to include the Day evidence of an earlier English discovery of America inside a larger perspective, but claims no objec-

[1] Mr. G. P. D. Naish points out to me that I have almost returned to the position reached by Bacon when he published *The history of the reign of King Henrie the Seventh* in 1622: "And there had beene before that time [1492] a discouerie of some *Lands*, which they tooke to bee *Islands*, and were indeed the *Continent* of *America*, towards the *Northwest*. And it may be that some Relation of this nature comming afterwards to the knowledge of COLUMBUS, and by him suppressed, (desirous rather to make his Enterprise the *Child* of his *Science* and *Fortune*, then the *Follower* of a former *Discouerie*) did giue him better assurance, that all was not at *Sea*, from the *west* of *Europe* and *Africke* vnto *Asia*" (1st edition, 1622, p. 188).



[1497–8] *John Day to the Grand Admiral. Archivo General de Simancas: Estado de Castilla, leg. 2, fo. 6. Published with the permission of the Director*

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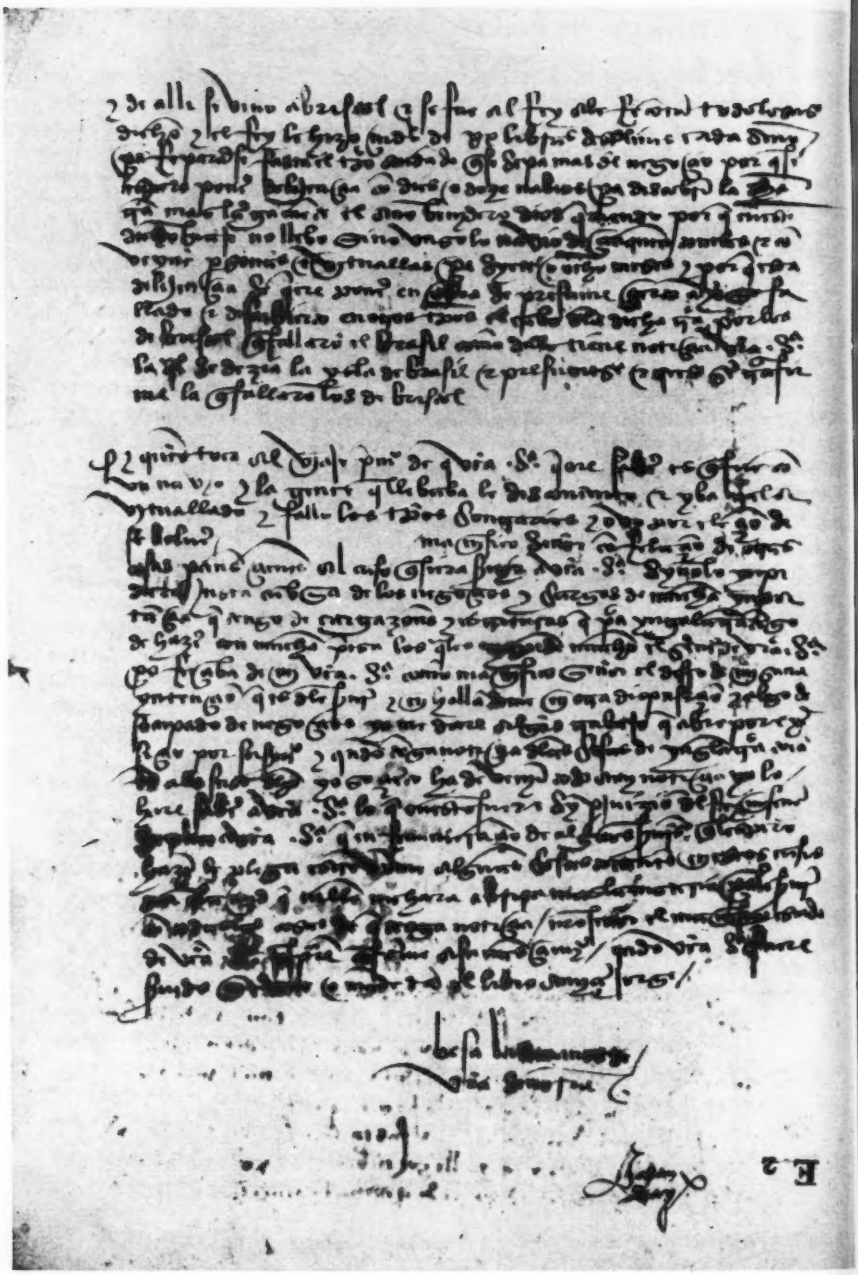

The reference to an English transatlantic discovery 'en otros tiempos' *occurs on line 9 above*

tive validity. It may be useful, however, as indicating one new perspective which the Day letter has made possible. There will, no doubt, be many others.

Acknowledgement.—My thanks are due to Professor A. E. Sloman and members of the School of Hispanic Studies, University of Liverpool, for having checked Dr. Vigneras's transcription and translation of the Day letter.

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LAND USE AND THE CHANGING POWER INDUSTRY IN ENGLAND AND WALES

J. R. JAMES, SHEILA F. SCOTT AND E. C. WILLATTS

THE REMARKABLE SPEED OF ADVANCE in industrial technology during the past twenty years is to be seen most clearly in the power industry. New sources of power have been developed, the older power industries have been reorganized and brought up to date and there has been a rapid extension of the electricity grid. The first industrial revolution concentrated fuel production, factories and people in a smoky chaos on the exposed coalfields, creating a new industrial landscape. The aim of this essay is to examine the changing land use patterns and landscape in the power industry which are emerging from this "second industrial revolution".

Post-war Growth and the Future of the Power Industry

Between 1946 and 1960 inland power consumption in the United Kingdom increased by nearly a third, industrial users accounting for most of this increase. Continued growth is certain though its speed may vary. In 1955 Dr. G. H. Daniel produced estimates (Daniel, 1955) of future energy consumption ranging from 305 to 377 million tons of coal equivalent (Ministry of Power, 1959) in 1975, an increase of from 22 to 51 per cent. In 1958–9 there was some slackening in national income growth and a set-back in power demands resulting in stocks of coal and surplus tanker and oil refinery capacity, but this appears to have been only a temporary check in the long-term trend of rising demand for power, resumed in 1960.

Figure 1 shows the post-war trends in inland power consumption. Coal still remains the most important primary source, 74 per cent. in 1960, but its importance has declined in the post-war period in competition with oil, which in the same year accounted for 25 per cent. Hydro-electricity makes a small contribution, most useful in Scotland, and nuclear energy is as yet insignificant quantitatively; together they provided 1 per cent. of the United Kingdom inland power consumption in 1960. For the future it seems likely that coal consumption will remain at about the same level and that it cannot make much contribution to rising demands, which will have to be met first by oil and then by nuclear power. Dr. Daniel estimated that by 1985 coal's share would have fallen to 47 per cent., oil's share have risen to 31 per cent. and hydro-electricity and nuclear power be contributing 22 per cent.

Thus the increasing demand for power is being met and must increasingly be met by the development of new sources, first oil and natural gas and then nuclear power. Associated with them are new industries such as petro-chemicals. In competition with new sources two major trends can be seen in the established power industries. Coal is increasingly being processed into more efficient and cleaner forms of power, gas, electricity and smokeless solid fuels, before it reaches the consumer, and secondly the coal, gas and electricity industries are all rationalizing production into larger units. Most far-reaching of all is the twofold movement towards the more widespread distribution of power. The siting of new power units, nuclear power stations and oil refineries, is in a peripheral pattern away from the coalfields. More important are the increasing ramifications of the electricity grid and the beginnings of a gas grid. Both developments have an immediate impact on the landscape, but their indirect effect, by increasing the mobility and changing the distribution of industry and population, may be even greater.

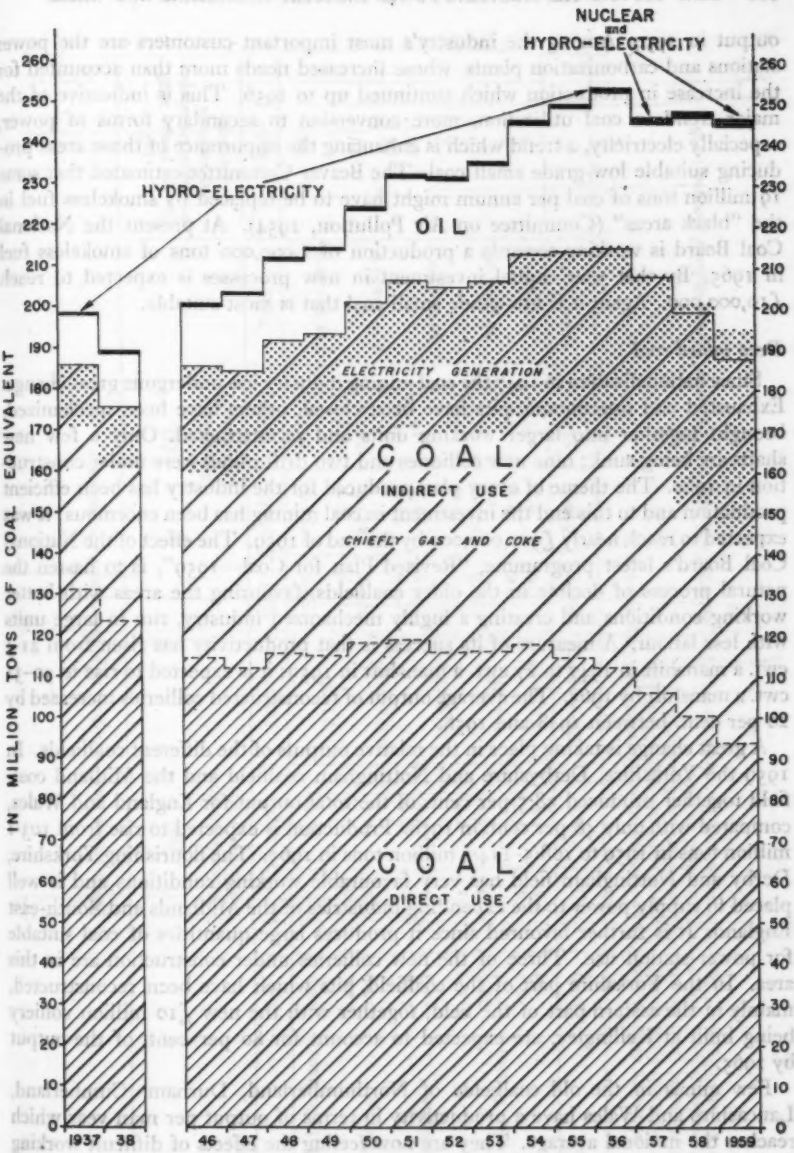


Fig. 1. United Kingdom sources of power

Coal

The coal industry in England and Wales produced about 187 million tons in 1959. Most of the coal is obtained by underground mining, though opencast working, started in 1942 and now coming to an end, contributed about 6 per cent. of the total

output in 1959. Among the industry's most important customers are the power stations and carbonization plants, whose increased needs more than accounted for the increase in production which continued up to 1956. This is indicative of the major trend in coal utilization, more conversion to secondary forms of power, especially electricity, a trend which is enhancing the importance of those areas producing suitable low-grade small coal. The Beaver Committee estimated that some 19 million tons of coal per annum might have to be replaced by smokeless fuel in the "black areas" (Committee on Air Pollution, 1954). At present the National Coal Board is working towards a production of 1,000,000 tons of smokeless fuel in 1965. By that year capital investment in new processes is expected to reach £10,000,000. Again it is low-grade small coal that is most suitable.

Deep mined coal

Since nationalization in 1947 the coal mining industry has undergone great change. Exhausted and uneconomic pits have been closed, others have been mechanized, brought together into larger working units and reconstructed. Only a few new shafts are being sunk; nine new collieries and two drift mines were under construction in 1960. The theme of every plan produced for the industry has been efficient production and to this end the investment in coal mining has been enormous; it was expected to reach nearly £900,000,000 by the end of 1959. The effect of the National Coal Board's latest programme, "Revised Plan for Coal—1959", is to hasten the natural process of decline in the older coalfields, favouring the areas with better working conditions and creating a highly mechanized industry, run in large units with less labour. A measure of its success is that productivity has risen from 21·5 cwt. a manshift in 1947 to 27 cwt. a manshift in 1959; it is expected to rise to 30–31 cwt. a manshift by 1965. The average output of reconstructed collieries increased by 20 per cent. between 1948 and 1958.

A great change is taking place in the relative outputs of the different coalfields. In 1959 the Yorkshire, Derbyshire and Nottingham coalfield and the Midland coalfield together produced 58·5 per cent. of the total output for England and Wales, compared with only 48 per cent. in 1938. Production is expected to rise from 103·1 million tons in 1959 to 108·5–114·5 million tons in 1965. The flourishing Yorkshire, Derby and Nottingham field has very favourable working conditions and is well placed to supply power to the expanding industries of the Midlands and South-east England. It is further favoured since it produces large quantities of coal suitable for power-station use. Three of the new collieries under construction are in this area. In the Yorkshire part of the coalfield, pits which have been reconstructed, mainly in the eastern part of the field, together with the new £10 million colliery being built at Kellingley, are expected to account for 80 per cent. of the output by 1965.

Few mines in the old coalfields of Northumberland, Durham, Cumberland, Lancashire and Wales have a productivity in terms of output per man year which reaches the national average. They are now feeling the effects of difficult working conditions and extensive exploitation in the nineteenth century, especially the coastal coalfields which met the heavy demands of the export and bunker trade. Their share in the national output is declining and is expected to decline still further. The table shows that often their total output is also decreasing. A few new pits are being sunk, for instance in Lancashire and South Wales, and many collieries are being reconstructed, with increased mechanization and higher productivity, but this is often not enough to take up all the manpower made redundant by closing the small, closely-spaced collieries which have been worked for a century or more and from which the

Deep-mined coal—Output, Manpower and Productivity

(1) Coalfields	(2) Saleable Output (million tons)				(3) Manpower (thousands)				(4) % of mines with productivity above the national average
	1938[1]	1948[2]	1958[2]	1965[3]	1938[1]	1948[4]	1958[2]	1965[3]	1955[5]
Northumberland and Durham	44·7	36·8	35·9	33–36	159·5	153·6	138·3	115·0–122·0	24
Cumberland	1·6	1·0	1·1		6·7	5·7	5·5		11
Yorks, Notts. and Derby ..	70·9	71·2	80·4	108·5–114·5	228·7	222·6	222·5	270·0–285·0	79
Midlands	23·4	24·0	23·9		78·8	75·8	70·4		68
Lancashire and Cheshire ..	14·3	12·0	12·6	11·5–12·5	58·3	52·3	46·1	39·0–43·0	29
North Wales	2·7	2·1	2·1		9·7	8·9	8·7		0
South Wales	35·3	22·3	21·0	24–26	134·8	107·7	94·7	90·0–94·0	15
Forest of Dean and Bristol	2·2	1·4	1·2		8·6	7·3	4·9		7
and Somerset	1·8	1·5	1·6	1·5–1·75	6·6	6·3	7·1	5·0–6·0	0
Kent									
England and Wales	196·9	172·3	179·8	178·5–190·75	691·7	640·2	598·2	519·0–550·0	—

Sources: [1] Ministry of Fuel and Power—Supplement to Statistical Digest 1945
[2] National Coal Board—Reports 1948 and 1958 (Vol. II)
[3] National Coal Board—Revised Plan for Coal 1959
[4] National Coal Board—unpublished returns
[5] T. M. Thomas, "Recent Trends and Developments in the British Coal Mining Industry" *Geographical Review* 1958

most accessible coal has already been won. The net result is that their total labour force is decreasing.

New collieries.—In Yorkshire and Nottingham, where production is still expanding, coal mining is moving into a predominantly agricultural area. It is interesting to compare the new collieries that are being built there with the collieries which created the nineteenth century mining landscape of, for instance, west Durham.

These new collieries are very large production units indeed. Kellingley in the West Riding has workable reserves of 200 million tons, equalling a year's production from the whole industry at present, and an estimated annual output by 1966 of 1,400,000 tons, not much less than that of the Kent coalfield. This colliery will employ 3000 men. Waste material from it will be dumped in disused limestone quarries 1^1_2 miles away at Knottingley. The quarries have ten years' capacity; when they are full the waste will be used to reclaim marshland to the south of the colliery.

Such large units often create the need for new or expanded settlements. The planning policy of Nottinghamshire County Council is to site the houses for a new colliery within easy reach of the pithead, but away from it. In contrast are the rows of miners' cottages in the old colliery villages under the shadow of the pitheaps and winding gear. There will, however, be large areas of railway sidings and frequently plant for coal washing and the manufacture of tar and coke. The coal preparation plant and sidings at Manvers in Yorkshire, serving four collieries, cover 112 acres. The new collieries are electrified and back stowage of pulverized waste is technically possible, though too costly to be general practice. A fundamental alteration in the character of an agricultural landscape is inescapable, but with fewer collieries, more widely spaced and of better design, the result will be very different from a nineteenth century mining landscape.

Decline and reorganization—the Durham coalfield.—Figure 2 shows, for the southern part of the Durham coalfield, how mining activity in the extreme south-west has now almost ceased and the centre of gravity has shifted to the east, with collieries progressively increasing in size. It is estimated that by 1965 two-thirds of the output of the Durham coalfield will come from reconstructed or reorganized pits, mainly in the east. Further decline in the west is inevitable as the reserves of many of the shallower pits are approaching exhaustion. Unless demand from the steel and gas industries for Durham coking coal is maintained the process will be accelerated by the closure of uneconomic as well as exhausted pits.

West Durham as a whole still has about 400,000 people primarily dependent on 40,000 miners; by the end of the century there may be less than 4000 miners. The plight of south-west Durham (the Urban Districts of Bishop Auckland, Crook and Willington, Shildon, Spennymoor and Tow Law) is even worse, for there the decline has been going on for a long time. Emigration was already heavy in the 1920's. By 1930 drainage difficulties, the approaching exhaustion of the better seams and depression in world trade had led to the closure of most of the mines in the area. The population fell from 124,000 in 1921 to 99,000 in 1939. The old mining towns and colliery villages became economically moribund and have never recovered. The story is one of decline in employment, protraction of life in town and village after their industrial life has gone, outworn fabric and gradual impoverishment. Unless positive planning action is taken this pattern of events may be repeated in the rest of west Durham and in other declining coalfields. Fortunately in south-west Durham there are already two positive moves to remedy the situation. The first is the distribution

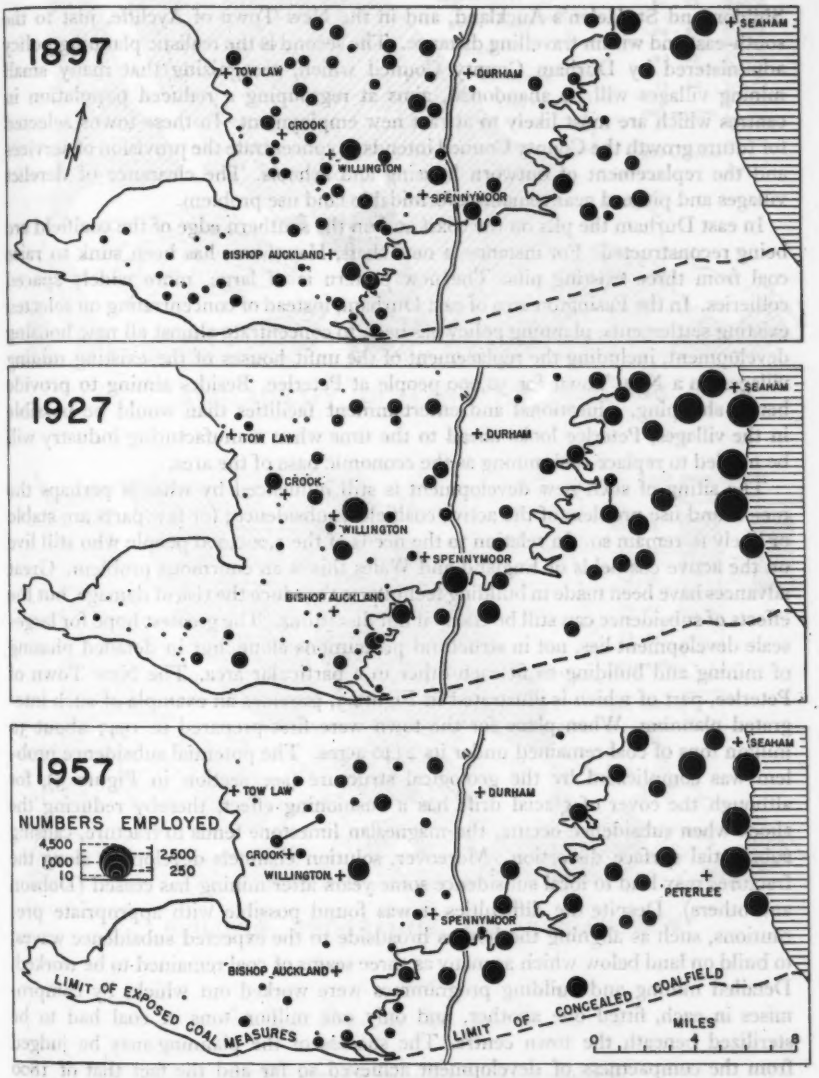


Fig. 2. Changing employment in South Durham coal mines. The symbols on these maps represent the total numbers employed at each mine, as given in the List of Mines *for each year. Where returns are given for the separate pits of one mine they are shown individually, but where, at a later date, only an aggregate return is published, the pits are shown linked together and the numbers employed apportioned in the same proportions as previously*

of industry policy of the Board of Trade, as a result of which new work is being taken into the area and is gradually changing its economy. Such employment is being concentrated on industrial estates in the larger settlements, Crook, Spennymoor,

Shildon and St. Helen's Auckland, and in the New Town of Aycliffe, just to the south-east and within travelling distance. The second is the realistic planning policy administered by Durham County Council which, recognizing that many small mining villages will be abandoned, aims at regrouping a reduced population in centres which are most likely to attract new employment. In these towns selected for future growth the County Council intends to concentrate the provision of services and the replacement of outworn housing and schools. The clearance of derelict villages and pithead gear remains a formidable land use problem.

In east Durham the pits on the coast and on the southern edge of the coalfield are being reconstructed. For instance, a new shaft, Hawthorn, has been sunk to raise coal from three existing pits. The new pattern is of large, more widely spaced collieries. In the Easington area of east Durham, instead of concentrating on selected existing settlements, planning policy has been to concentrate almost all new housing development, including the replacement of the unfit houses of the existing mining villages, in a New Town for 30,000 people at Peterlee. Besides aiming to provide better shopping, educational and entertainment facilities than would be possible in the villages, Peterlee looks ahead to the time when manufacturing industry will be needed to replace coal mining as the economic base of the area.

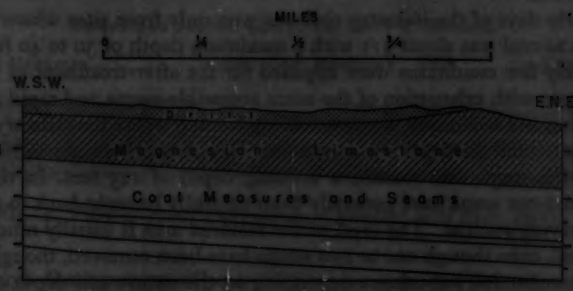
The siting of such new development is still influenced by what is perhaps the major land use problem of the active coalfields, subsidence; for few parts are stable or likely to remain so. In relation to the needs of the 5,000,000 people who still live on the active coalfields of England and Wales this is an enormous problem. Great advances have been made in building techniques to reduce the risk of damage, but the effects of subsidence can still be costly if not disastrous. The greatest hope for large-scale development lies, not in structural precautions alone, but in detailed phasing of mining and building to fit each other in a particular area. The New Town of Peterlee, part of which is illustrated in Figure 3, provides an example of such integrated planning. When plans for the town were first prepared in 1947 about 30 million tons of coal remained under its 2340 acres. The potential subsidence problem was complicated by the geological structure (see section in Figure 3), for although the cover of glacial drift has a cushioning effect, thereby reducing the shock when subsidence occurs, the magnesian limestone tends to fracture, causing substantial surface distortion. Moreover, solution channels developing along the fractures may lead to local subsidence some years after mining has ceased (Dobson and others). Despite the difficulties it was found possible with appropriate precautions, such as aligning the houses broadside to the expected subsidence waves, to build on land below which as many as three seams of coal remained to be worked. Detailed mining and building programmes were worked out which, by compromises in each, fitted one another, and only one million tons of coal had to be sterilized beneath the town centre. The success of the planning may be judged from the compactness of development achieved so far and the fact that of 1800 houses subjected to subsidence movement by 1958 only eight had suffered any reported damage (Dobson and others, 1960).

The disposal of waste material.—Back stowage of waste material is now possible in some of the new pits which are being constructed, but these are the exception. In addition to the 2000 existing colliery waste heaps, covering about 30,000 acres, a further 500 acres are likely to be needed annually for new tips and the expansion of existing tips. With increasing mechanization the proportion of waste material brought to the surface is increasing.

Where there is a commercial use for the material the spoil heaps are being removed.

AVAILABILITY OF LAND FOR BUILDING

BUILDING PROGRAMME AND ACHIEVEMENT



Section across area (partly conjectural)

Fig. 3. The northern part of Peterlee New Town, showing how its development has been phased in relation to the availability of land after the extraction of coal

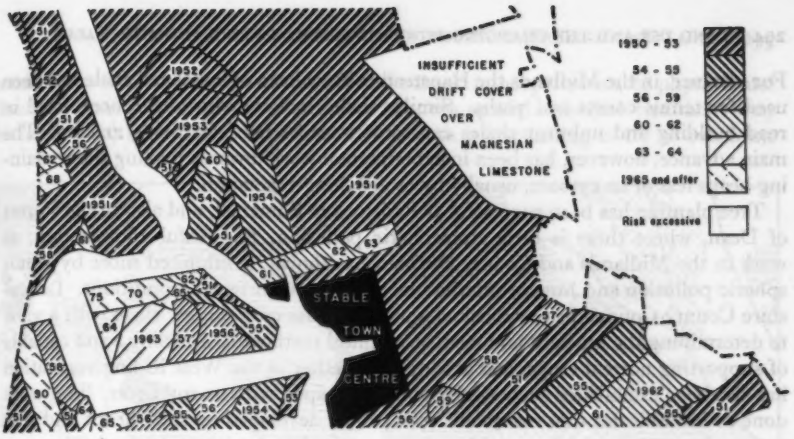
Shildon and St. Helen's Auckland, and in the New Town of Aycliffe, just to the south-east and within travelling distance. The second is the realistic planning policy administered by Durham County Council which, recognizing that many small mining villages will be abandoned, aims at regrouping a reduced population in centres which are most likely to attract new employment. In these towns selected for future growth the County Council intends to concentrate the provision of services and the replacement of outworn housing and schools. The clearance of derelict villages and pithead gear remains a formidable land use problem.

In east Durham the pits on the coast and on the southern edge of the coalfield are being reconstructed. For instance, a new shaft, Hawthorn, has been sunk to raise coal from three existing pits. The new pattern is of large, more widely spaced collieries. In the Easington area of east Durham, instead of concentrating on selected existing settlements, planning policy has been to concentrate almost all new housing development, including the replacement of the unfit houses of the existing mining villages, in a New Town for 30,000 people at Peterlee. Besides aiming to provide better shopping, educational and entertainment facilities than would be possible in the villages, Peterlee looks ahead to the time when manufacturing industry will be needed to replace coal mining as the economic base of the area.

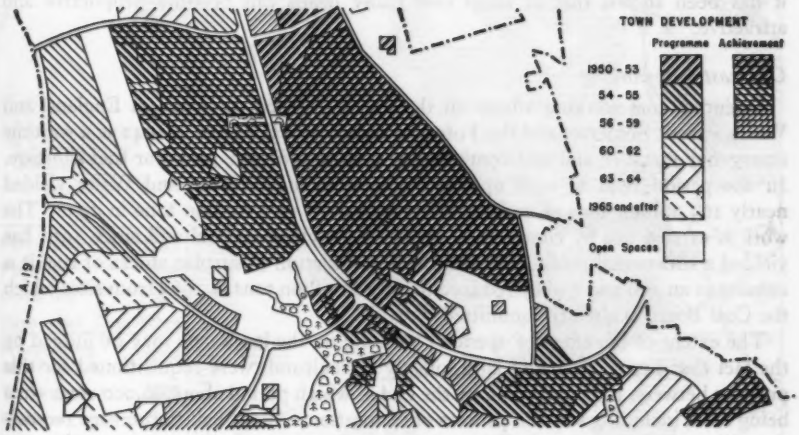
The siting of such new development is still influenced by what is perhaps the major land use problem of the active coalfields, subsidence; for few parts are stable or likely to remain so. In relation to the needs of the 5,000,000 people who still live on the active coalfields of England and Wales this is an enormous problem. Great advances have been made in building techniques to reduce the risk of damage, but the effects of subsidence can still be costly if not disastrous. The greatest hope for large-scale development lies, not in structural precautions alone, but in detailed phasing of mining and building to fit each other in a particular area. The New Town of Peterlee, part of which is illustrated in Figure 3, provides an example of such integrated planning. When plans for the town were first prepared in 1947 about 30 million tons of coal remained under its 2340 acres. The potential subsidence problem was complicated by the geological structure (see section in Figure 3), for although the cover of glacial drift has a cushioning effect, thereby reducing the shock when subsidence occurs, the magnesian limestone tends to fracture, causing substantial surface distortion. Moreover, solution channels developing along the fractures may lead to local subsidence some years after mining has ceased (Dobson and others). Despite the difficulties it was found possible with appropriate precautions, such as aligning the houses broadside to the expected subsidence waves, to build on land below which as many as three seams of coal remained to be worked. Detailed mining and building programmes were worked out which, by compromises in each, fitted one another, and only one million tons of coal had to be sterilized beneath the town centre. The success of the planning may be judged from the compactness of development achieved so far and the fact that of 1800 houses subjected to subsidence movement by 1958 only eight had suffered any reported damage (Dobson and others, 1960).

The disposal of waste material.—Back stowage of waste material is now possible in some of the new pits which are being constructed, but these are the exception. In addition to the 2000 existing colliery waste heaps, covering about 30,000 acres, a further 500 acres are likely to be needed annually for new tips and the expansion of existing tips. With increasing mechanization the proportion of waste material brought to the surface is increasing.

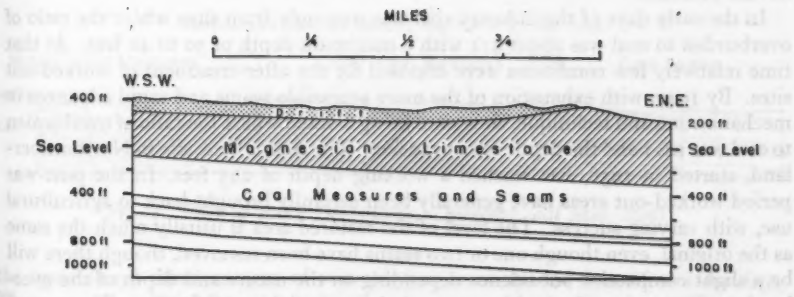
Where there is a commercial use for the material the spoil heaps are being removed.



AVAILABILITY OF LAND FOR BUILDING



BUILDING PROGRAMME AND ACHIEVEMENT



Section across area (partly conjectural)

Fig. 3. The northern part of Peterlee New Town, showing how its development has been phased in relation to the availability of land after the extraction of coal

For instance, in the Midlands the Hanstead colliery heap of burnt red shale has been used for tennis courts and paths. Similar shales in Lancashire have been used in road building and unburnt shales can sometimes be used for brick making. The main advance, however, has been in experimental work towards making the remaining heaps less of an eyesore, usually by establishing vegetation.

Tree planting has been successful at Radstock in Somerset, and also in the Forest of Dean, where there is little atmospheric pollution. Successful afforestation, as work in the Midlands and County Durham has shown, is inhibited more by atmospheric pollution and human interference than by adverse soil conditions. Lancashire County Council has established a pioneer grass crop on raw shale with a view to determining the quickest and most economical method of obtaining a soil capable of supporting normal crops, and at Hoyland Nether in the West Riding vegetation has also been established successfully directly on spoil with no soil cover. The work done so far indicates that reasonable soils can be developed on spoil heaps and that toxic substances in the heap seldom have continuing detrimental effects. Average costs in the West Riding for liming, fertilizing and seeding to produce pasture suitable for cattle grazing are only about £50 an acre and in various parts of the country it has been shown that at small cost many heaps can become productive and attractive.

Opencast coal working

Opencast coal working affects all the major exposed coalfields in England and Wales, except Somerset and the Forest of Dean. It was begun in 1942 as a wartime emergency measure and was continued to help to meet the post-war fuel shortage. In the period 1942 to 1958 opencast operations in England and Wales yielded nearly 165 million tons of coal, reaching a peak of 13·5 million tons in 1958. The work is carried out by contractors, provides the cheapest coal and since 1952 has yielded a substantial profit, but with the accumulation of surplus stocks of coal it is coming to an end and will be reduced to only 2 million tons in 1965 from sites which the Coal Board is already committed to work.

The extent of the effect of opencast working on the landscape may be judged by the fact that 110,000 acres of land, mostly agricultural, were requisitioned for this purpose between 1942 and 1958, by the end of which period about 60,000 acres were being held, including some in process of restoration. About half the acreage requisitioned is actually excavated. Figure 4 shows what these figures may mean in a particular area, 25 square miles of Derbyshire in 1957, which is by no means untypical of that coalfield.

In the early days of the industry coal was won only from sites where the ratio of overburden to coal was about 4:1 with a maximum depth of 30 to 40 feet. At that time relatively few conditions were imposed for the after-treatment of worked-out sites. By 1947, with exhaustion of the more accessible seams and rapid advances in mechanization and technique, sites were being worked where the ratio of overburden to coal was 12:1 and the depth 100 to 120 feet. The Acorn Bank site in Northumberland, started in 1956, has reached a working depth of 225 feet. In the post-war period worked-out areas have generally been carefully brought back to agricultural use, with varying success. The level of the restored area is usually much the same as the original, even though one or two seams have been removed, though there will be a slight compaction subsidence depending on the nature and depth of the overburden. The two main problems are drainage and loss of fertility. The use of heavy machinery sometimes creates an impermeable hard-pan surface, which may necessitate mole-drainage operations or tile drainage. Loss of fertility appears to

result from the long storage of the soil and subsoil in heaps, where its physical and chemical state may change. Where this happens special chemical treatment may be needed for some time. Experimental research is continuing to try to overcome

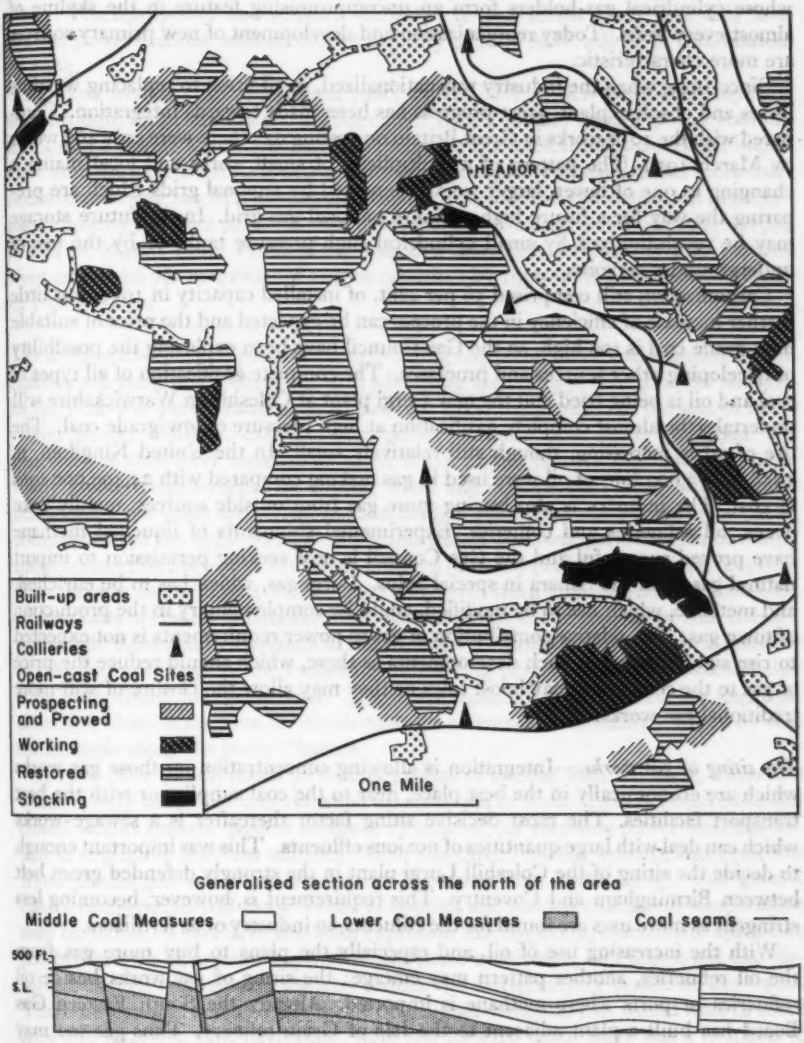


Fig. 4. Part of south Derbyshire. Opencast coal sites, 1957

the agricultural disadvantages of waterlogging, erosion and loss of soil fertility. There are also complaints about the disappearance of hedgerows but the ultimate effect on the landscape is far less disfiguring than the subsidence hollows, spoil heaps and pithead gear associated with underground mining.

Gas

The gas industry only contributes 7 per cent. to the total power consumption of the United Kingdom. It is traditionally associated with the many small gas works whose cylindrical gas-holders form an uncompromising feature in the skyline of almost every town. Today reorganization and development of new primary sources are more characteristic.

Since 1949, when the industry was nationalized, in addition to replacing wartime losses and obsolete plant, great progress has been made towards integration. Compared with the 1050 works in Great Britain on vesting day there were only 463 works by March 1959. The pattern of a multiplicity of small works and local mains is changing to one of fewer, larger works connected by regional grids which are preparing the way for a future high-pressure national gas grid. In the future storage may be revolutionized by small cylindrical high-pressure tanks or by the use of underground reservoirs.

Carbonization still comprised 56 per cent. of installed capacity in 1959, but little further increase of efficiency in the process can be expected and the price of suitable high-grade coal is too high, so the Gas Council have been exploring the possibility of developing other sources and processes. The complete gasification of all types of coal and oil is being tried and the new Lurgi plant at Coleshill in Warwickshire will undertake the almost complete gasification at high pressure of low-grade coal. The use of oil is increasing, though still relatively small. In the United Kingdom, in 1958/9, 673,000 tons of oil were used in gas making compared with 24,499,000 tons of coal. The industry is also buying more gas from outside sources, mainly coke ovens, oil refineries and collieries. Experimental shipments of liquefied methane have proved successful and the Gas Council is now seeking permission to import natural gas from the Sahara in special ships. Lurgi gas, which has to be enriched, and methane, which has to be modified, could be complementary in the production of town gas. The relative contribution of gas to power requirements is not expected to rise significantly but such developments as these, which should reduce the price of gas to the consumer, may boost sales or they may allow the closure of still more traditional gas works.

The siting of gas works.—Integration is allowing concentration on those gas works which are economically in the best place, near to the coal supplies or with the best transport facilities. The most decisive siting factor thereafter is a sewage works which can deal with large quantities of noxious effluents. This was important enough to decide the siting of the Coleshill Lurgi plant in the strongly defended green belt between Birmingham and Coventry. This requirement is, however, becoming less stringent as more uses are found for the effluents, in industry or as fertilizers.

With the increasing use of oil, and especially the plans to buy more gas from the oil refineries, another pattern may emerge: the siting of gas works beside oil refineries or ports where methane is imported. Already the South Eastern Gas Board has built a plant adjacent to the Isle of Grain refinery. Thus gas too may participate in the new peripheral pattern of power sources.

Electricity

The great growth of electricity consumption from 15·8 million tons of coal equivalent in 1938 to 56·2 million tons in 1959 represents not only the rising demand for power, but also the increasing conversion of primary fuels into secondary forms,

in this case more flexible, cleaner and moreover with the best developed distribution system. It is not only coal which is being increasingly converted into electricity, but also the newly developing primary sources, oil and nuclear power. At present oil amounting to 9 million tons of coal equivalent per annum is used to generate electricity. Nuclear power has suffered setbacks; it now seems likely that only five nuclear power stations with an output capacity of 2075 MW will be in commission by 1965.

Between March 1948 and March 1960, 15,845 MW of new generating capacity were brought into commission. By the end of 1964 a further 23 new power stations and 4 new sections should be installed, including the nuclear stations. Small inefficient stations have been scrapped and the average capacity of stations has more than doubled to nearly 120 MW of installed capacity, so that the vast expansion in generating capacity has been achieved with a net decrease from 291 power stations in 1948 to 234 at March 1960. Productivity has also increased. In 1948–9, 2·81 persons were employed per megawatt of output capacity; by 1959–60 this had been reduced to 1·50 persons.

The siting of coal-burning power stations.—Siting requirements of coal-burning power stations are continually changing with advancing technology. The greatest changes in the post-war period have been consequent upon the increase in the size of individual power stations. Coal-burning power stations now being designed are generally of 1000 MW capacity or more, are of higher thermal efficiency and have vastly greater requirements for cooling water and coal supplies than stations commissioned a few years ago. They have individual generating units of up to 550 MW compared with the usual 60 MW of the immediate post-war period. This development means that the size of buildings in terms of cu. ft. per kilowatt can be reduced. West Burton in the Trent Valley, 2000 MW, will burn approximately 20,000 tons of coal daily when on maximum load. At least three other stations of this size are projected. Recent developments in high voltage transmission have made it possible to take full advantage of the economies of locating power stations on the coalfields supplying cheap low-grade coal. The other main location pattern has been on estuaries, close to markets, to which coal can be carried reasonably cheaply by sea, for example along the lower Thames.

A 1000 MW station needs 30 million gallons of cooling water an hour, where the water is only used once and returned direct to sea or river. Less is required in the closed circuit system, used of necessity in most of our riverside power stations, but this is expensive and less efficient. With the direct cooling system, however, the water discharged will be 10–20 degrees F warmer than at the intake. Too great a rise in temperature will cause weeds to flourish and sudden changes in temperature may harm fish. Fears have also been expressed that high temperature will accelerate the breakdown of organic impurities and cause a nuisance, and also lower the dissolved oxygen content and thereby reduce the self-purifying power of the water. These objections, and also the thesis that higher temperatures would lead to more fogs and interfere with navigation, were put forward when there was a proposal to build a power station on the River Calder at Wakefield. The detrimental effects of raising the temperature are now known to be less than was feared a few years ago (Ross, 1959) but it is clear that, apart from coastal sites, only very large rivers are suitable water sources for the direct cooling method, and even there the power stations must be sufficiently far apart for the water to be an effective cooling agent for all of them.

Another siting requirement for a power station is a large area of reasonably level

land. Castle Donington covers 190 acres. Increasing size means fewer but larger sites, including probably a large area for rail sidings. The site must be free from subsidence, a difficult requirement on the coalfields, and have good load-bearing qualities.

Oil-fired power stations have much the same detailed siting requirements as coal-burning stations, but for obvious reasons are usually located on estuarine sites near markets but away from the coalfields.

The Trent Valley below the town of Burton is being developed with by far the largest single concentration of new generating capacity in Great Britain. This is a response to cheap low-grade small coal from the Derby, Nottingham and Leicester coalfields, reasonable proximity to the expanding industrial areas and, especially, the presence in the River Trent of the largest underdeveloped reserve of cooling water in eastern England, with a minimum recorded flow in 1959 at Colwick, just below Nottingham, of 470 million gallons per day (Engineer to the Trent River Board, 1961). This siting is thought to represent the present optimum in economic coal-fired power station location.

It depends on the fact that it is cheaper to transmit power by grid than to carry coal (especially overland) to distant power stations, even though the thermal efficiency of the newer stations is rising markedly. In the United States pulverized coal is carried successfully by pipeline as a slurry. Hydraulic transport of coal is now being considered in this country and, if the method should prove successful, the situation could change once again. At present the limiting factor in the siting of stations is the availability of cooling water, but a new technique, now being incorporated in the existing station at Rugeley, may enable power stations in future to be sited independently of large natural supplies of water.

Air pollution and disposal of waste material.—Sulphur dioxide pollution of the atmosphere by power stations is dealt with by tall chimneys which achieve dilution of the effluent by widening the area of fall-out. They are designed to give a maximum sulphur dioxide content at ground level of 0·2 parts per million. With the increasing size of stations, chimneys must be even higher. Thus the two chimneys at Drakelow B which daily emit 160 tons of SO^2 are 400 feet high, whereas those at Drakelow C, 500 tons daily, will be 550 feet high. The even larger West Burton station will have 600-ft. chimneys. There are reasonable hopes that these will emit gases of sufficient thermal momentum to punch their way through any fog or temperature inversion which is likely to occur. Such chimneys are a possible obstruction to flying and may therefore be a further limiting factor in the siting of power stations.

Atmospheric pollution from dust is not serious, grit arrestors are now 98–99 per cent. efficient, but the problem of disposal of fuel ash is enormous and continues to grow. The provisional estimate of output of power station ash from the Trent Valley stations in 1967 is about $3^1{}_2$ million cubic yards. West Burton alone will eventually produce $1^1{}_3$ million cubic yards of ash per year and the Drakelow stations a similar amount.

Only a small quantity of ash finds an economic use, in making bricks, light-weight aggregates and concrete-type blocks, and the great bulk has to be tipped. The cheapest and most efficient method of disposal for distances of up to 5 miles is to pump it as a slurry. Over longer distances it may be dampened and transported by road; a closed container to prevent dust nuisance is necessary if it has to travel more than about 10 miles. The problem is thus to find a suitable hole within reasonable distance of the power station. Wet gravel pits are ideal, but dry pits, subsidence hollows and natural depressions can also be used. With the subsequent replacement

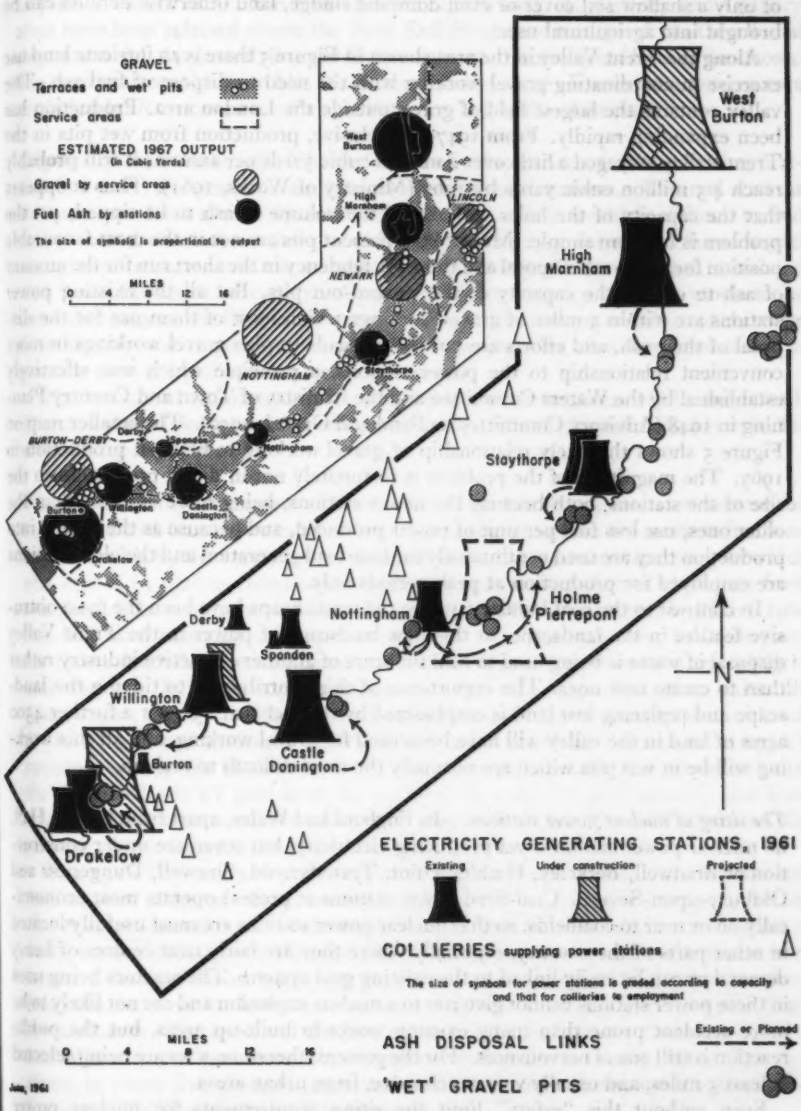


Fig. 5. Trent Valley, pits and power: showing the relationship between the existing and proposed power stations in the middle Trent Valley, their sources of fuel and the gravel pits to some of which the powdered fuel ash is conveyed. In July 1961 the Minister of Power announced that he had decided to reject the application of the Central Electricity Generating Board for consent to build a 2000 MW power station at Holme Pierrepont close to Nottingham which is shown as "projected" here and on Fig. 6.

of only a shallow soil cover or even domestic sludge, land otherwise derelict can be brought into agricultural use.

Along the Trent Valley in the area shown in Figure 5 there is an intricate land use exercise in coordinating gravel working with the need to dispose of fuel ash. The valley contains the largest field of gravel outside the London area. Production has been expanding rapidly. From 1947–58 inclusive, production from wet pits in the Trent Valley averaged a little over 2 million cubic yards per annum; it will probably reach 4·5 million cubic yards by 1967 (Ministry of Works, 1961). Thus it appears that the capacity of the holes will exceed the volume of ash to be tipped, yet the problem is far from simple. Many of the present pits are not in the most favourable position for cheap ash disposal and there is a tendency in the short run for the amount of ash to exceed the capacity of the worked-out pits. But all the existing power stations are within 5 miles of gravel workings which most of them use for the disposal of their ash, and efforts are now being made to plan gravel workings in more convenient relationship to the power stations, a principle which was effectively established by the Waters Committee and the Ministry of Town and Country Planning in 1948 (Advisory Committee on Sand and Gravel, 1950). The smaller map on Figure 5 shows the likely relationship of gravel working to fuel ash production in 1967. The magnitude of the problem is fortunately not in direct proportion to the size of the stations, both because the newer stations, being more efficient than the older ones, use less fuel per unit of power produced, and because as they come into production they are used continuously for base load generation and the older stations are employed for production at peak periods only.

In contrast to the coal industry, where the waste heaps have been the most obtrusive feature in the landscape, in this new landscape of power in the Trent Valley disposal of waste is being used to heal the scars of another extractive industry rather than to create new ones. The importance of this contribution to tidying the landscape and replacing lost land is emphasized by the fact that by 1981 a further 4500 acres of land in the valley will have been used for gravel working, and all this working will be in wet pits which are normally the most difficult to reclaim.

The siting of nuclear power stations.—In England and Wales, apart from Calder Hall, no nuclear power station is yet producing electricity, but seven are under construction at Bradwell, Berkeley, Hinkley Point, Trawsfynydd, Sizewell, Dungeness and Oldbury-upon-Severn. Coal-fired power stations at present operate most economically on or near to coalfields, so that nuclear power stations are most usefully located in other parts of the country, especially where they are fairly near centres of heavy demand or can be easily linked to the existing grid system. The reactors being used in these power stations cannot give rise to a nuclear explosion and are not likely to be more accident prone than many existing works in built-up areas, but the public reaction is still one of nervousness. For the present, therefore, sites are being selected at least 5 miles, and usually very much more, from urban areas.

Even without this "safety" limit the siting requirements for nuclear power stations are stringent. Very large quantities of cooling water are required for the condensers of the steam plant; Hinkley Point, for example, will need 35 million gallons an hour, making it essential for the site to be on a coast, large estuary or lakeside. On tidal shores siting will be further limited by the need to place intakes where they will not be affected by silting, but yet be as close as possible to the station. The site needs to be of about 100 acres, fairly flat and very little above sea level and with good road access. It must also have a fault-free foundation capable of carrying the great weight of the reactors, for they weigh about 60,000 tons and

impose a load of more than four tons per square foot. At Berkeley and Oldbury sites have been selected where the New Red Sandstone emerges from the alluvial deposits which, in general, line the Severn estuary. Similarly at Hinkley the chosen site is an outcrop of Lower Lias shales close to the shore. Even so the two reactors are being built on concrete rafts 130 feet × 107 feet and 11 feet thick.

Disposal of waste material.—The net result of these various factors affecting location is a pattern of scattered and almost wholly coastal stations. (Thermal stations too may soon have to seek the coast for cooling water.) It would be difficult to find many coastal sites where there would not be some opposition, but the stringent siting requirements make the suitable sites very few and they are often in isolated and beautiful tracts of country. Opposition from amenity societies tends to be increased because the life of reactors now being built is not yet certain, and there are fears that the stations may remain as derelict eyesores long after they have ceased to provide even the palliative of local employment.

The amount of radioactive waste from nuclear power stations will be very small. Disposal should not present any major difficulty and valuable uses already exist for some of the material.

The distribution of electricity.—The remote siting of nuclear power stations and the location of coal-burning stations near the coal rather than near the markets has been made possible by the very great extension of the transmission system, the grid which was started in 1926 to coordinate supplies by bulk transmission of electricity from one part of the country to another. The first grid was of 132 kV and by March 1960 this had been extended over 5462 route miles. By 1945, however, its inadequacy for future loads had become apparent and the superimposition of a 275 kV grid was decided. It is this super-grid that permits very large generating units. By March 1960, 1215 route miles had been constructed and 377 route miles were in hand. A 380 kV grid was envisaged for the future and most of the towers of the 275 kV system were capable of carrying it. However, it has recently been announced that the projected 380 kV grid is to be replaced by a 400 kV grid, and for new lines this will have towers 20 feet taller than any built so far. Figure 6 illustrates the present and projected transmission lines in relation to power stations.

The 132 kV system now covers most of the inhabited areas of the country, and further lines of lower voltage complete the distribution system. Great progress has also been made at this end of the scale. In the Midlands and South-east England at least, the network is now so fine that the cost of connecting a house to the mains is no longer a financial factor inhibiting the spread of housing in the countryside away from the main roads. In more remote rural areas the advance has been even more revolutionary. The spread of distribution costs between urban and rural supplies is enabling even the remotest parts of England and Wales to benefit. More than four farms in every five are now connected to the grid, and electricity is becoming as indispensable to agriculture as to industry.

Since each line of the 275 kV grid has a carrying capacity six times that of a line of the old 132 kV system, its total impact is less than if that system had been extended but it has greater repercussions on land use, especially farming, in the areas through which it passes. The height of the towers on level ground is 136 feet for the "super-grid" compared with 80 feet for the old, and by the end of 1959 there were 5400 of the taller towers. The dimensions of the base have increased from 12 feet square to 24 feet square and the nuisance value to the farmer of a tower in a cultivated field is out of all proportion to its size. In wooded country the grid lines have even greater

repercussions on land use, though they may be more concealed from view. A band must be cleared on either side of the lines to give adequate clearance for the wires; if the trees reach an average height of 70 feet this would have to be 100 feet wide midway between the towers at maximum sag. In exposed moorland areas, on open

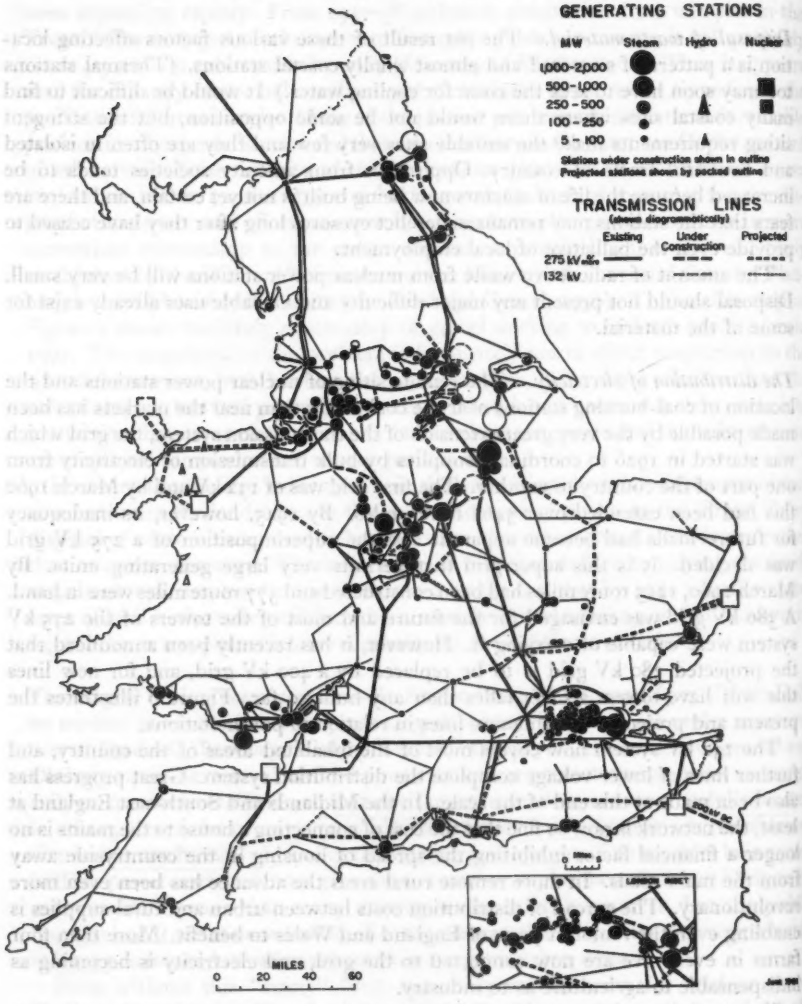


Fig. 6. Electricity

downland or in areas of great scenic value such as the National Parks, the intrusion of the super-grid provokes strong opposition.

It is the extension of the grid which has the most widespread visual impact on the country as a whole. A comparison of Figure 6 with Figure 7, which depicts National Parks and Areas of Outstanding Natural Beauty, shows the extent of the land use

conflict in areas where the appearance of the rural landscape should be the first concern. Fortunately, under the Electricity Act 1957, the Generating Board now has a statutory duty to consider the impact of its activities on amenity.

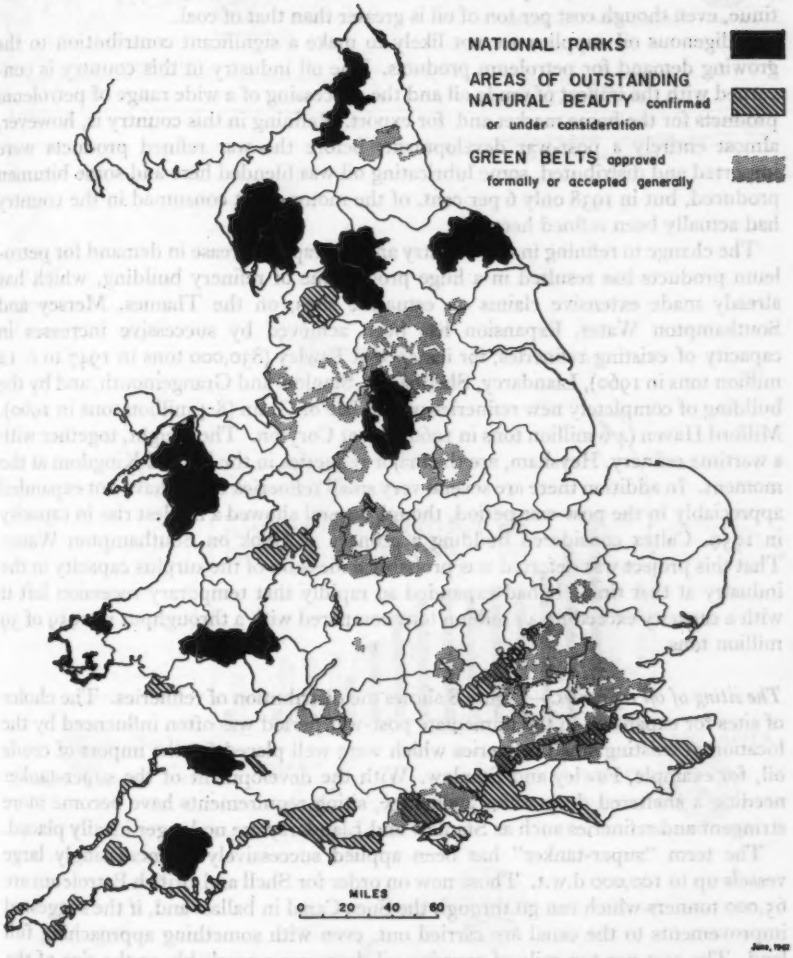

NATIONAL PARKS
AREAS OF OUTSTANDING NATURAL BEAUTY confirmed or under consideration
GREEN BELTS approved formally or accepted generally
MILES
0 20 40 60

Fig. 7. Conservation of the countryside, showing the areas where the countryside is, or is likely to be, specially protected. They cover 22·8 per cent of the whole countryside

Oil

Consumption of petroleum products in the United Kingdom increased fivefold between 1938 and 1960. Oil contributed 6·6 per cent. of our primary fuel supplies at the beginning of the period and 25 per cent. in 1960. The most significant increase has been in the consumption of fuel oils, from 628,000 tons in 1938 to over 13·8 million tons in 1959. It has been perhaps the greatest single factor in breaking

down a pattern of fuel supplies based on coal, which had been built up over 150 years. The story of expanding demand for fuel oil has been one of successful competition with coal. As the calorific value of one ton of oil equals that of 1·7 tons of coal, and oil is in every way a more efficient fuel, this trend may be expected to continue, even though cost per ton of oil is greater than that of coal.

Indigenous oil supplies are not likely to make a significant contribution to the growing demand for petroleum products. The oil industry in this country is concerned with the import of crude oil and the processing of a wide range of petroleum products for the home market and for export. Refining in this country is, however, almost entirely a post-war development. Before the war refined products were imported and distributed, some lubricating oil was blended here and some bitumen produced, but in 1938 only 6 per cent. of the motor spirit consumed in the country had actually been refined here.

The change to refining in this country and the rapid increase in demand for petroleum products has resulted in a huge programme of refinery building, which has already made extensive claims on estuarine sites, on the Thames, Mersey and Southampton Water. Expansion has been achieved by successive increases in capacity of existing refineries, for instance at Fawley (830,000 tons in 1947 to *c.* 12 million tons in 1960), Llandarcy, Shellhaven, Stanlow and Grangemouth, and by the building of completely new refineries on the Isle of Grain (8·4 million tons in 1960), Milford Haven (4·6 million tons in 1960) and at Coryton. These eight, together with a wartime refinery, Heysham, are the major refineries in the United Kingdom at the moment. In addition there are several very small refineries which have not expanded appreciably in the post-war period, though several showed a modest rise in capacity in 1959. Caltex considered building a refinery at Hook on Southampton Water. That this project was deferred was probably a measure of the surplus capacity in the industry at that time. It had expanded so rapidly that temporary recession left it with a capacity exceeding 43 million tons compared with a throughput in 1959 of 39 million tons.

The siting of oil refineries.—Figure 8 shows the distribution of refineries. The choice of sites for expansion in the immediate post-war period was often influenced by the location of existing small refineries which were well placed for the import of crude oil, for example, Fawley and Stanlow. With the development of the super-tanker needing a sheltered deep-water anchorage, siting requirements have become more stringent and refineries such as Stanlow and Llandarcy are no longer ideally placed.

The term "super-tanker" has been applied successively to increasingly large vessels up to 100,000 d.w.t. Those now on order for Shell and British Petroleum are 65,000 tonners which can go through the Suez Canal in ballast and, if the suggested improvements to the canal are carried out, even with something approaching full load. The cost per ton-mile of carrying oil decreases remarkably as the size of the vessel increases, and since transport costs form a large part of the outgoings of an oil company, the use of these large vessels is likely to grow. However, a fully laden 65,000 tonner needs a draught of more than 45 feet and a sheltered anchorage. Besides depth and shelter, tidal velocity and range and possible interference by other shipping with tanker operations all matter, since quick turn round is essential to economic operation.

Transport costs also figure largely in distribution costs and the refinery should be as close as possible to markets, other things being equal. Suitable rail facilities are generally required. Other limitations are a large, relatively flat site capable of bearing the heavy loads of refinery plant. Storage is a large user of land because refining

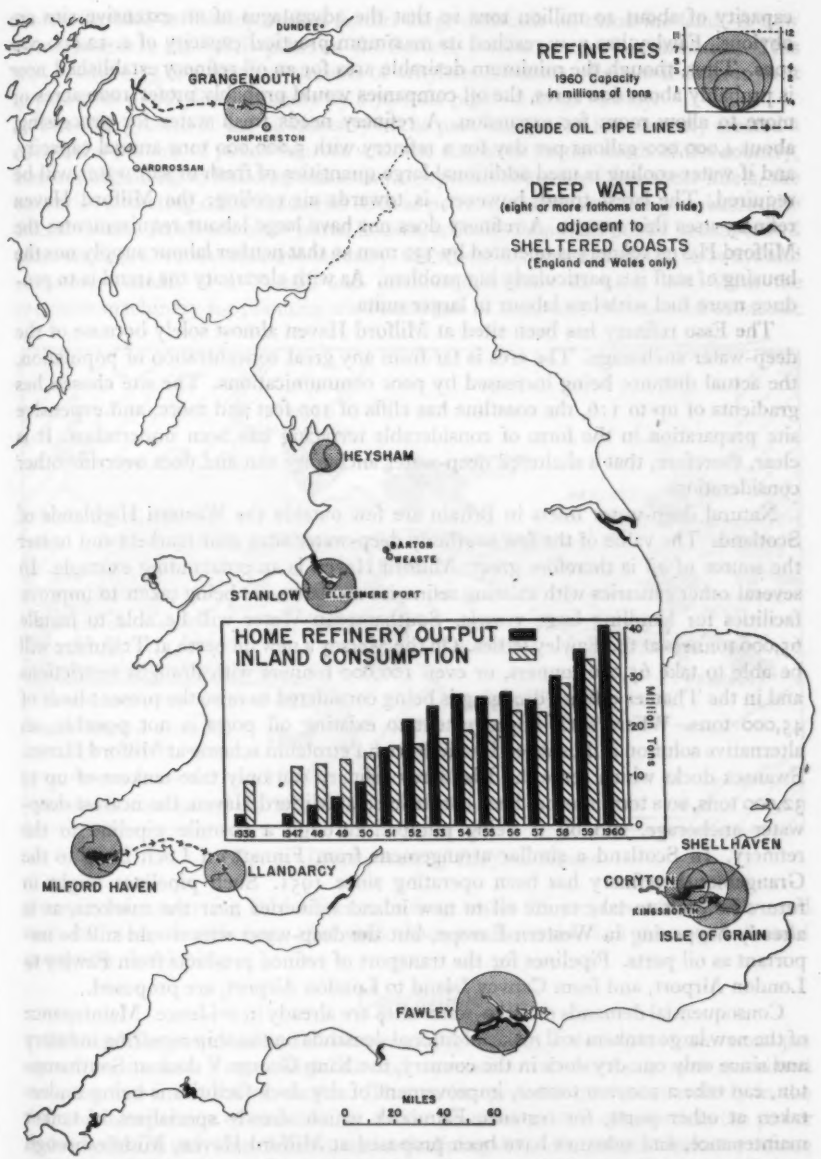


Fig. 8. Petroleum in the United Kingdom, showing both the increasing importance of British oil refining and the relationship of large refineries to deep sheltered anchorages suitable for large tankers

is continuous, but crude oil is received and the product is despatched intermittently and demand is seasonal. Safety precautions add to the land needed for plant and storage. Refining costs diminish with increasing size of plant up to an annual

capacity of about 10 million tons so that the advantages of an extensive site are obvious. Fawley has now reached its maximum practical capacity of *c.* 12,000,000 tons. Thus, though the minimum desirable area for an oil refinery established now is probably about 600 acres, the oil companies would probably prefer 1000 acres or more to allow room for expansion. A refinery needs fresh water for processing, about 4,000,000 gallons per day for a refinery with 5,000,000 tons annual capacity, and if water cooling is used additional large quantities of fresh or salt water will be required. The latest trend, however, is towards air cooling; the Milford Haven refinery uses this system. A refinery does not have large labour requirements; the Milford Haven refinery is operated by 330 men so that neither labour supply nor the housing of staff is a particularly big problem. As with electricity the trend is to produce more fuel with less labour in larger units.

The Esso refinery has been sited at Milford Haven almost solely because of the deep-water anchorage. The area is far from any great concentration of population, the actual distance being increased by poor communications. The site chosen has gradients of up to 1:6, the coastline has cliffs of 100 feet and more, and expensive site preparation in the form of considerable terracing has been undertaken. It is clear, therefore, that a sheltered deep-water anchorage can and does override other considerations.

Natural deep-water inlets in Britain are few outside the Western Highlands of Scotland. The value of the few southerly deep-water sites near markets and nearer the source of oil is therefore great; Milford Haven is an outstanding example. In several other estuaries with existing refineries measures are being taken to improve facilities for handling large vessels. Southampton Water will be able to handle 65,000 tonners at the Fawley jetties. On the Mersey a new oil berth at Tranmere will be able to take 65,000 tonners, or even 100,000 tonners with draught restrictions and in the Thames estuary dredging is being considered to raise the present limit of 45,000 tons. Where such improvement to existing oil ports is not possible, an alternative solution is illustrated by the British Petroleum scheme at Milford Haven. Swansea docks which serve the Llandarcy refinery can only take tankers of up to 32,000 tons, so a terminus has been constructed at Milford Haven, the nearest deep-water anchorage, and oil is being pumped through a 60-mile pipeline to the refinery. In Scotland a similar arrangement from Finnart on Loch Long to the Grangemouth refinery has been operating since 1951. Such pipelines might in future be built to take crude oil to new inland refineries near the markets, as is already happening in Western Europe, but the deep-water sites would still be important as oil ports. Pipelines for the transport of refined products from Fawley to London Airport, and from Canvey Island to London Airport, are proposed.

Consequential demands on deep-water sites are already in evidence. Maintenance of the new large tankers will make additional demands on the ship repairing industry and since only one dry dock in the country, the King George V dock at Southampton, can take a 100,000 tonner, improvement of dry dock facilities is being undertaken at other ports, for instance Falmouth which already specializes in tanker maintenance, and schemes have been proposed at Milford Haven, Middlesbrough and Greenock. Figure 9 shows the cumulative effect of these demands on land at Milford Haven.

The by-products of a refinery have also made possible the manufacture of a wide range of organic chemicals previously imported or derived from coal or molasses. By the mid-1960's it is estimated that 70 per cent. of the national output of organic chemicals will come from petroleum. The siting of petro-chemical works close to the refineries, for example Monsanto Chemicals, the International Rubber Company and

Union Carbide at Fawley, makes further large demands on estuarine land. A new development is the I.C.I. plant on the Severn, 3 miles north of Avonmouth. This will produce 35,000 tons per annum of ethylene products. Esso will deliver to it 40,000 tons of ethylene annually by a 70-mile pipeline from Fawley.

Thus the growth of the oil industry in the post-war period has not only created a peripheral pattern of power sources with the emphasis on the south of the country, but it is beginning to build up industrial complexes alongside deep-water inlets, the refineries attracting other industries such as petro-chemicals and the gas plant at the Isle of Grain. At all our older ports, houses, schools, shops and public houses crowd close on docks, warehouses and industry, the whole cut across by roads, railways and sometimes canals in a chaotic and inefficient mixture of land uses. With the requisite machinery for planning the future use of land, and the national economic

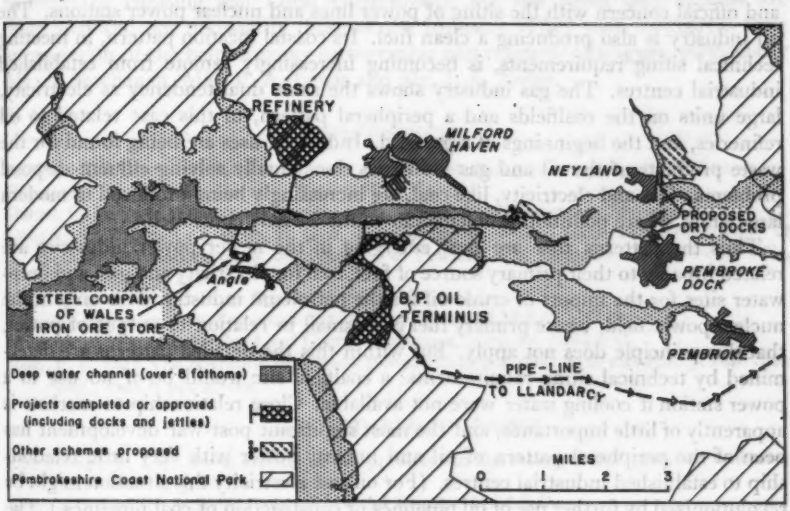


Fig. 9. Development of Milford Haven

necessity of conserving land adjacent to deep water for projects which really need such facilities, there is hope that such chaos can be avoided in the new industrial ports now developing.

Conclusion

Demand for power increased between 1945 and 1955 at about 2·8 per cent. per annum compound, a rate which can find a precedent only in the growth associated with the first industrial revolution. That earlier growth was almost entirely in the form of an expansion of coal mining. In the post-war pattern of growth in the power industry coal is only one element, and a declining one, in a complex industry whose land use and visual impact covers almost the whole country and is not confined to the coalfields.

In the older coalfields the decline begun in the inter-war period is being accelerated by the need for efficiency in the coal industry if it is to compete with new forms of power. But manufacturing industry is changing the pattern to one of transition rather than hopeless decline. In the active and expanding areas of the coalfields reorganization and modernization are producing a pattern of large, widely spaced

collieries, some without pitheaps, and new towns or villages which are not built right beside the pit. Opencast coal working too has made a considerable contribution to the increasing demand for power without permanently scarring the landscape. A beginning has been made in the improvement of the appearance of old pitheaps.

The greatest changes, however, are in the rapidly expanding parts of the power industry. The electricity industry shows a vast extension of the grid and great changes in the location of generating capacity. The inter-war pattern of small units near the markets has been succeeded by one of large units concentrated on the coalfields or on estuarine sites, with remote peripheral location of nuclear power stations. The expansion of the electricity industry means an expansion in the use of clean power. Also significant are the careful control of air pollution, the method of disposal of fuel ash, ameliorating the effects of an extractive industry, and the public and official concern with the siting of power lines and nuclear power stations. The oil industry is also producing a clean fuel. Its coastal location pattern, in meeting technical siting requirements, is becoming increasingly remote from established industrial centres. The gas industry shows the same dual tendency as electricity, large units on the coalfields and a peripheral pattern, in this case related to oil refineries, and the beginnings of a gas grid. Industrial uses are being found for the waste products of the oil and gas industries, incidentally solving effluent disposal problems. Gas and electricity, like coal, are increasingly being produced in modern large units, where pollution problems can be more easily controlled.

Thus the patterns that are now emerging in the newer power industries are related broadly to their primary source of fuel, coal for electricity and gas, and deep-water sites for the import of crude oil for the petroleum industry. It is only in the nuclear power field, where primary fuel is so small in relation to output of power, that this principle does not apply. But within this the detailed patterns are determined by technical siting requirements: a coalfield site would be of no use to a power station if cooling water were not available. Close relationship to markets is apparently of little importance, and the most significant post-war development has been of the peripheral pattern of oil and nuclear power with very little relationship to established industrial centres. (For oil and electricity this situation might be revolutionized by further use of oil pipelines or construction of coal pipelines.) The extension of distribution systems has made this post-war pattern possible and also means that industry need not follow the power. There are some signs, however, that oil refineries may, by attracting the petro-chemicals industry, create new industrial centres. Southampton Water illustrates the possibility.

The other most noticeable feature emerging from this review of the power industry is that, although its impact is now so much more widespread, it is becoming much cleaner and more neighbourly. In part this is inherent in the nature of the new sources of power, and in the older industries it is due to technical advances and developing markets for waste products; but reclamation of tip heaps, disposal of fuel ash in gravel workings, improved siting of housing on coalfields, careful after-treatment of opencast workings, control of pollution and care and interest in the siting of new developments, all arise from increasing social consciousness and appreciation of landscape which have their roots in a revulsion from the squalor and chaos of the first industrial revolution. They are some very positive achievements of the machinery, both local and central, which since the 1947 Town and Country Planning Act has been responsible for land use planning in this country. But there is no room for complacency. The power industry raises a fundamental question for land use policy; how much are we prepared to pay to safeguard the quality of our countryside, especially the National Parks and Areas of Outstanding Natural Beauty; to

keep power stations, for instance, out of Snowdonia? No one would deny the right of isolated farms to have a supply of electricity, and clearly here a compromise must be reached between landscape preservation and economic provision. Sometimes, and in some areas, there may be no room for compromise; many feel that that is the case in our National Parks. Alternatively it can be argued that, just as we cannot afford to subsidize declining industry, similarly we cannot afford to subsidize less economic location for our power industry merely in order to safeguard areas of high landscape value. But in a country where the competition for land is so keen and where a growing urban population is increasingly seeking a retreat and recreation in the shrinking areas of unspoilt country the answer is, we cannot afford not to do so.

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VOYAGE TO THE ÎLES CROZET AND ÎLES KERGUELEN

H. W. TILMAN

ÎLES CROZET (they are French possessions) are a small group of barren, uninhabited islands in lat. S. 47°, about halfway between the Cape of Good Hope and Australia. The group consists of five widely scattered islands of which only three, Île aux Cochons, Île de la Possession, and Île de l'Est, are of respectable size. Possession, the biggest, is about ten miles long and four miles wide. Of the other two, Îles des Apôtres is merely a group of rocky pinnacles, and Îles des Pingouins a rock 500 ft. high, the size of a large fortress, with one small outlier. They were discovered in 1772 (the same year as Kerguelen) by the French navigator Marion-Dufresne who also discovered what are now called Marion and Prince Edward Islands. After the murder of Marion-Dufresne in New Zealand his second-in-command, Crozet, took command and his name was subsequently applied by Captain Cook to the whole group. Cook himself did not visit the Crozet. In the first part of the last century the islands were the haunt of British and American sealers until, by 1870, the seals had been exterminated. Since then they have been deserted except for fleeting visits by expedition ships bound for Kerguelen or the Antarctic. As well as being remote and inaccessible, which to my mind are desirable features, the bigger islands are mountainous. According to the *Antarctic Pilot* the mountains of Possession and Île de l'Est are "about 5000 feet high and snow covered". The great prize in those regions for a mountaineer is Big Ben on Heard Island, 9000 feet high and draped in ice and snow almost from sea to summit. Heard Island lies some 300 miles south-east of Kerguelen. I had intended going there, but having learnt that there was no safe anchorage for a boat to lie while the climbing party was ashore, I funked it. For sailing to the islands I had *Mischief*, an ex-Bristol Channel Pilot Cutter of 29 tons, built and registered at Cardiff in 1906. Finding a crew for a small, private venture of this kind is not easy. A month before sailing day I had two—W. A. Procter, who had sailed with me in Patagonian waters in 1956, and Roger Tufft who had only just returned from three years on a base in the Antarctic. To find three more I put an advertisement in *The Times*: "Hands wanted for long voyage in small boat. No pay, no prospects, not much pleasure." From twenty replies, some of them serious, I got the three more men I needed. None had any experience of sailing small boats but one had crossed the Atlantic fifty-one times in the *Queen Mary* playing the double bass in the ship's orchestra.

The first few days at sea with an inexperienced crew can be very harassing, but on a long voyage there is time to learn. Before we reached Las Palmas on 17 August 1959 most of them knew which rope to pull without holding a debate. We left there on August 23. Thence to Cape Town by the sailing ship route is over 6000 miles and it took us 71 days, an average of 85 miles a day. The only land sighted was South Trinidad, an uninhabited island of exciting rock scenery lying 500 miles off the Brazilian coast. We met only one steamer. We reached Cape Town on November 1, and having enjoyed much help and hospitality, particularly from the Royal Cape Yacht Club, we left on December 2 to begin the serious part of the voyage. South of Cape Town, where a ship soon enters upon the Roaring Forties, gales are frequent even in the Southern summer; added to that, it is far from any steamer track, so that a boat must be well-found and able. I think that this time (we had made a previous

and less fortunate attempt in 1957) the weather favoured us. The wind seldom fell below Force 6, which is what *Mischief* likes, and the gales that blew were neither violent enough nor lasted long enough to build up dangerously high seas with breaking crests, the sort of seas which two years earlier had swept our dinghy overboard, done some damage on deck and obliged us to put back to Durban. As we drew south the weather became colder, wetter and windier. In about lat. 47° S. the Antarctic Convergence is crossed where the sea temperature makes a sudden drop of some 10° F. But in these cold, grey waters there is far more bird life than in tropic seas where a whole day may pass without sighting a bird. Here the majestic albatross wheel and glide incessantly, small flocks of homely black-and-white speckled cape pigeons gather round the ship, and the sturdy little storm petrels dance on the waves.

Having sighted Marion Island, where the South African Government maintains a

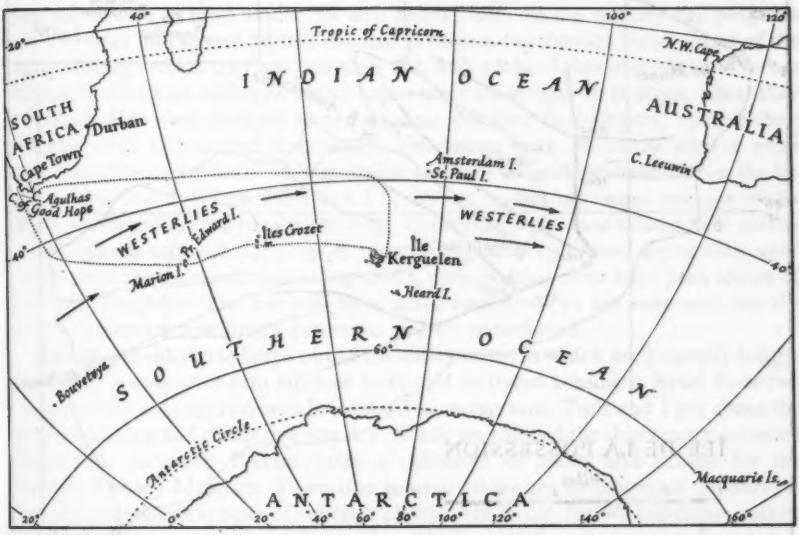


Figure 1

weather station, we ran down our easting for the Crozet some 600 miles away on the same latitude. Of several unpleasant things that might happen on the voyage what scared me most was the chance of missing the islands, or worse still hitting one in the dark, or one of the sunk rocks which abound in their vicinity. The islands are small and scattered, visibility in those regions is often poor, and if thick weather prevented us from getting sights we might find ourselves blown past the islands with little hope of being able to beat back against the strong prevailing westerlies. On the night of December 26, when I judged the most westerly islands to be somewhere near, we hove to. Dawn of the 27th revealed Îles des Pingouins some 3 miles away. We were now pretty confident of finding our objective, Île de la Possession, which lay 60 miles further east. The glass was falling, wind and sea rising, while black rain squalls drove across from the north-west. However, at midday, between squalls, we sighted our island and sped towards it under trysail and reefed foresail before a big following sea with albatross wheeling in our wake. After rounding its southernmost

point we smoothed our water but in the lee of the land the wind seemed more violent, sweeping over the low cliffs and whipping water from the surface like the willy-waws of the Patagonia channels. A waterfall dropping over the cliffs hurled its water in every direction except downwards. Of the two possible anchorages we chose Baie du Navire, which looked much less snug from the sea than it had on the chart. To make it in the teeth of a violent wind we had to use our engine with all the power it had, and that evening we dropped anchor in 5 fathoms, a cable's length from a beach of black sand white with penguins. And no sooner had Procter returned in the dinghy after laying out a second anchor than a small school of killer

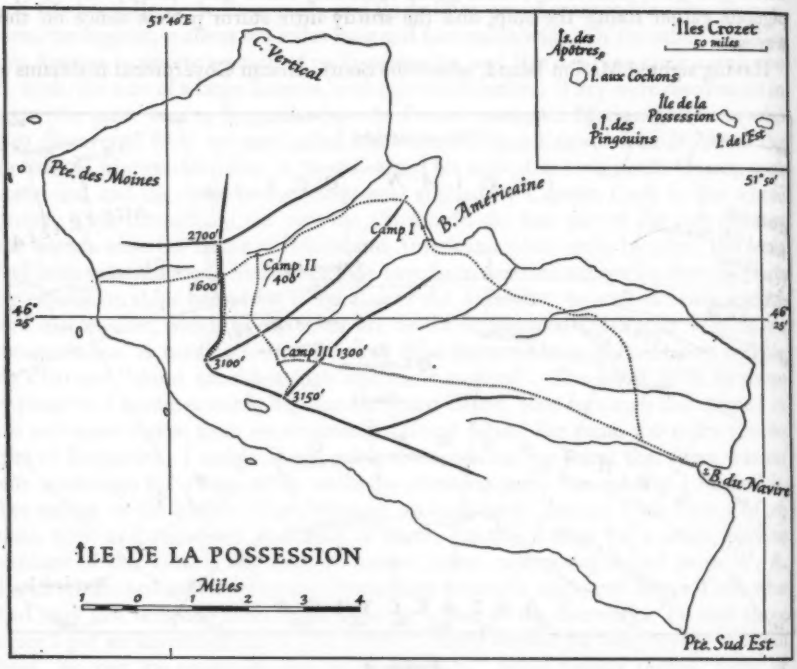


Figure 2

whales circled the ship, their long black fins sticking out of the water in menacing fashion.

As Baie du Navire is open to the east, an easterly gale would oblige one to quit, but gales from that quarter are rare in those parts and *Mischief* lay there securely for fifteen days while Tufft and I with a tent and a fortnight's food went ashore to find and climb the highest mountain. Climbing it proved easier than finding it. Low cloud generally lay over the island, and it was a week later, after we had climbed what we took to be the highest, that we saw two others obviously higher. The highest proved to be only 3150 feet and, although the last 500 feet were snow-covered at the time, the snow was not permanent. Most of it had gone before we left the islands. Nor did the mountains of Île de l'Est, only 10 miles from Possession, appear to be any higher or to hold more snow. The islands are of volcanic origin and, since the mountains are not high enough to have permanent snow or glaciers, they afford no

climbing in the technical sense. That they proved to be 2000 feet lower than reputed was of course disappointing to us after so long a voyage. There is no map of the islands. The coastline and off-lying dangers are well charted, but the surveying ship which did this evidently made a bad guess at the height.

The rich wild-life of the island made full amends for the mountains. The smelly, clamorous rookery of several thousand king penguins—one rookery of several—was alone worth a long voyage. Besides, there were hundreds of sea elephants or elephant seals, slug-like creatures weighing anything up to 2 tons, dozing on the beaches or in the grass a mile or more from the sea. Wandering albatross and giant petrels nested on the grassy slopes, little white sheathbills scavenged among the penguins and skua gulls followed us about. The king penguins seemed to have a monopoly of the beaches, the numbers of gentoo or rockhoppers were inconsiderable. On behalf of the California Wild Life Society, Tufft ringed some 200 albatross. He was expert enough to do it single-handed, lifting the great bird off its nest and holding it with its neck under his arm behind him. In the rookery the penguins were so thick on the ground that one had to force a way through them. Most of the birds had eggs which they carry on their feet with a fold of skin over them. The sea elephants dozed on, taking no notice unless one walked right up to them, when they either shuffled away backwards or reared up on their fore-flippers, opened their mouths wide and snarled ferociously. The young ones, about the size of prize sows, liked being stroked. At Baie Américaine, the alternative anchorage on the lee side of the island, where Tufft and I spent two nights, we found remains of the sealers' huts and several big iron tripods. The sealing ships used to land their parties on the islands and pick them up six months or even a year later. From 1805 until 1870, when the seals were almost wiped out, these beaches must have been scenes of frightful slaughter. The fur seals have never recovered (we saw only one), but the sea elephants are now pretty numerous and are unmolested.

Inland, provided one keeps out of the valley bottoms which are generally boggy, the going is easy over firm volcanic scree and scattered boulders. Apart from two days of thick driving rain which confined us to our tent, Tufft and I got about the island, carrying and climbing every day. While we climbed the ship's party occupied themselves variously. Procter made a collection of plants and lichens for the Natural History Museum. Vegetation is scant; there are neither trees nor shrubs, and only seventeen species of vascular plants. Above 500 feet all vegetation ceases, except for odd specimens of Kerguelen cabbage which sometimes we found surviving at 2000 feet. Another of the party, who was a keen amateur geologist, collected rocks, and a third amused himself with a ·22 rifle in pursuit of rabbits. Once these were very plentiful, but they seem now to have disappeared. For fresh food we ate penguin and albatross eggs, and a few penguins and cormorants.

Having cleared up the mountain problems in an unexpectedly short time we decided to go on to Kerguelen, 700 miles further east in lat. 49° S. We might have explored Île de l'Est, only 10 miles from Possession, but the mountains there looked no higher and held no more snow. Kerguelen is a rugged, mountainous island, 75 miles long from west to east, remarkable for its extremely indented coastline with large peninsulas, wide bays, and long fjords dotted with hundreds of islands and islets. Îles Kerguelen, as it is properly called, is an archipelago of more than 300 islands and islets. It was first sighted (in 1772) by the Breton nobleman, Kerguelen-Trémarac, who thought he had discovered the great southern continent upon which the explorers and geographers of those days were so intent. He named it "South France". But the following year when he returned to follow up this great discovery he had to acknowledge he had made a mistake. The story that in his disappointment

he changed the name to Desolation Island is apocryphal. Seven days of continuously strong westerly winds brought us to Kerguelen, where we made our landfall not far from Christmas Harbour at the north-west extremity, where Captain Cook landed on Christmas Day 1776. He it was who called it Desolation Island, a name which on most days is appropriate enough. But on the rare days when the sun shines, cloud shadows drift across the russet fells and the sea and the glaciers sparkle, it appears a lovely island. Running parallel to the west coast is an extensive ice cap which sends down numerous glaciers almost to sea level both to east and to west; for on the east

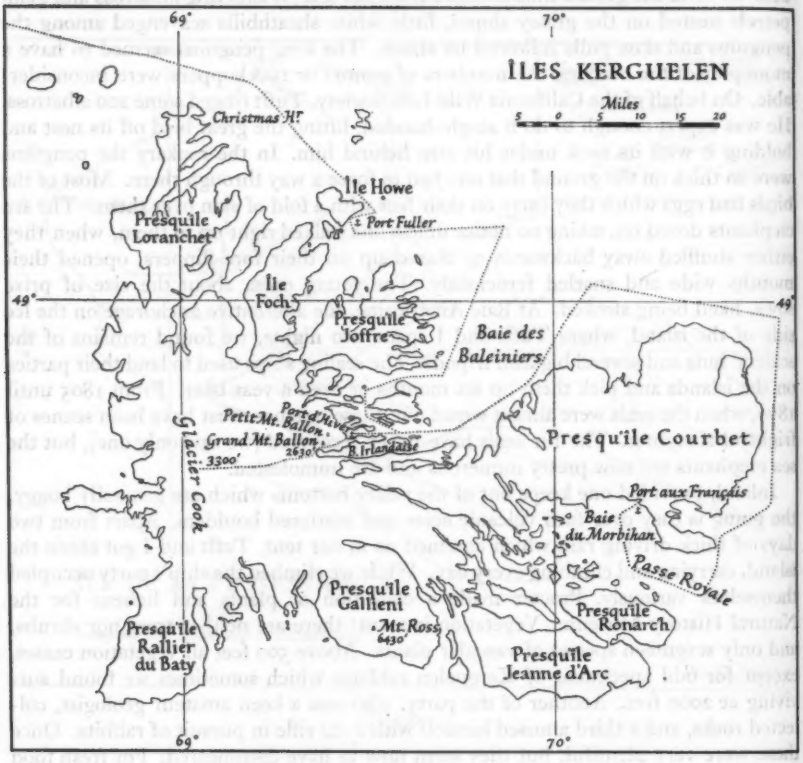


Figure 3

is the great Baie des Baleiniers with numerous fjords running inland towards the ice cap. On the chart the whole ice cap is called Glacier Cook. As no height was given for this we imagined no one had been on it, so we decided to have a look at it. Having found a secure anchorage at the head of a long fjord called Port d'Hiver, on the east side of the ice cap, Tufft and I left the ship, taking a tent and a fortnight's food. After reconnaissance we found a glacier some 4 miles inland at the head of a long, flat valley draining into Baie Irlandaise, a fjord to the south of our anchorage. The snout of the glacier was less than 100 feet above sea level. It appeared to be retreating slowly. This glacier, which is about half a mile wide, is for the first mile extremely broken. We avoided the broken part, got on to névé, and at about 4 miles from the snout and at a height of 3000 feet reached the ice cap proper, a flat expanse

of uncrevassed snow some 25 miles long and 8 miles wide. The ice cap summit we made to be 3300 feet by aneroid. We crossed it and went down the west side for a couple of miles until stopped by low cloud and my inability to go any further. Above this cloud bank, which was a sort of sea fog extending up to the 1500-foot level, the sky was clear, the sun shone, and the glare and heat of the snow field was fierce. In the distance, some 25 miles to the south-east, we could see Mt. Ross, a fine double peak of Alpine character 6430 feet high, the highest mountain on the island and yet unclimbed. The existence of such an extensive field of ice at so low an altitude in so low a latitude is very remarkable.

The French have a weather station and scientific base at Port aux Français in Baie de Morbihan at the south-east end of the island. It was about 70 miles sailing from where we were and, owing to an unusual spell of calm weather, it took us four days to reach it. No doubt the Frenchmen were astonished to see a small yacht sailing up the bay. M. Heurgon, the base leader whom I had met in Paris some years before, came off and took us ashore to the little jetty where all hands had assembled to welcome us. There are 67 men at the base including 15 scientists. It was a Sunday, happily enough the lunch hour, so we were taken to the mess where we all sat at one long table and amidst a most convivial clatter and uproar began a meal such as only Frenchmen could conjure up on a barren island. That they should live well was to be expected, but that they should live almost entirely upon fresh food was to us astonishing. By means of glass frames and intensive cultivation a skilled Malagasy gardener produces an ample supply of lettuce, tomatoes, radishes, spinach, potatoes. They have flocks of ducks and hens, cows for their milk and butter and also a piggery. On a neighbouring islet they run several hundred sheep which provide the finest mutton one could wish. When one island is grazed out they move them to another. The mainland, by the way, is overrun with rabbits so that herbage is scant. An attempt is being made to breed reindeer, and M. Heurgon, a keen fisherman, has started a trout hatchery. All the huts and living rooms are centrally heated with hot and cold water laid on. Oil supplies the heat and power, but in the near future it is hoped to make use of water power. Near the base a small private company runs a factory for processing oil from sea elephants which are killed on nearby beaches to the licensed number of 1000 a year. The carcasses are hauled overland by Weasels, chopped up and fed into a hopper, and thence into huge pressure cookers. The residue, an oily meal, is fed to the livestock. But the base is mainly for weather observation and research into magnetism, cosmic rays, the ionosphere and suchlike abstruse subjects. A few years ago there was talk of making an airfield, for Kerguelen is halfway on the shortest air route between the Cape and Australia, but this is now in abeyance.

When we sailed on 2 February 1960 for Cape Town the kind Frenchmen filled *Mischief* with good things, among them a huge carboy of red wine and a gallon jar of rum. Perhaps the most serious mishap of the voyage was the breaking of this jar before it was half finished. Having worked up north to lat. 34° S., where we were clear of the prevailing westerlies, we were able to lay the course for Cape Town which we reached on March 15. We left again, homeward bound, on April 2 and the same night, tumbling about in a rough sea with no wind, the topmast forestay rigging screw stripped with the result that the bowsprit broke. We put back to have it mended and left again on April 8. Our only call on the homeward run was at St. Helena. This island, which once enjoyed prosperity as a port of call, now faces hard times. The passing of sail, the opening of the Suez Canal, and the withdrawal of the garrison left it dependent on its one rather meagre export, New Zealand flax. The once-monthly call of a Union Castle steamer has now to be paid for. The *Windsor*

Castle arrived while we were there, and as there were two ships in the harbour the Governor kindly asked their respective masters to lunch.

The homeward track for sailing ships passes west of the Azores, but we managed to cut a corner and passed between Flores, the most westerly island, and Fayal. From there to the Channel seemed no distance at all and we sailed up Lymington river on 30 June 1960 after an eleven months' voyage of some 21,000 miles.

DISCUSSION

Evening Meeting, 10 April 1961

Before the paper, the PRESIDENT (Lord Nathan) said: The lecturer this evening is Major Tilman, a Gold Medallist of this Society. He has spent long years in exploration and in mountaineering and he has gained a name and reputation extending far beyond this country. He climbed Nanda Devi in 1936, and in 1938 he led the Mount Everest Expedition of that year. But he was not content with that—he sailed the seas, in his yacht *Mischief*, by the coasts of Patagonia, mapping them, exploring them and also the ice cap of Patagonia, and adventuring into the islands of the Southern Ocean.

Also here this evening we have another Fellow of the Society who is addicted to the sea—Francis Chichester, who not so very long ago sailed across the Atlantic single-handed, took six weeks at it and won the day for himself and for England.

Major Tilman then read his paper

The PRESIDENT: We must express our very warm appreciation. I will say nothing about the adventurous trip which our lecturer has made, because something is to be said about that by Francis Chichester. I may say that sailing the Atlantic alone was not Chichester's only solo voyage; when I crossed the Tasman Sea I did not know that I was following a track which had been blazed by him flying solo before the war.

Mr. Francis CHICHESTER: When a famous mountaineer-expeditionist takes to the sea it's fascinating to wonder why, and I have followed the Tilman career since he went to the Patagonian ice cap on his first expedition to those parts. Now he has sailed to the same Southern Ocean again and it increases one's curiosity to know why? These seas we have been looking at in these lovely photographs, these seas in the Roaring Forties, are very formidable. I recall that Joshua Slocum, the first man to go round the world alone, when he was sailing off the coast of Patagonia, records seeing a big wave approaching, and he had just time to haul himself up the mast when the wave broke and submerged the vessel; it was, in his opinion, a minute before he saw the deck of his boat again. Then there was Smeaton, who was sailing on the other side of Patagonia, and he was in a gale running with bare poles broadside to the waves; he was rolled over and lost his mast and was very lucky to get his wife back, who was fifty yards from the boat—and, I believe, his cap too! He was fortunate to get back to port and to be able to repair his boat, but he had a tremendous ambition to sail round the Horn. He started off again and, coming into another gale, he said to himself: "Once is enough"; he was not going to be caught again and this time he lay with the stem on to the waves, and there came a big wave which turned him stem over stern.

And then of course there is Shackleton—you remember his famous boat voyage from Elephant Island to South Georgia. He records that at one time he looked out and saw that the storm clouds were lightening, and he called to his crew that the storm was clearing. Then he realized that it was an enormous wave-crest he was looking at. Well, these Roaring Forties are formidable waters and perhaps that is why Major Tilman wanted to go down into them. But that was not enough for him; he had to have his boat, built in 1906, and I do think that there is an extra hazard in navigating the Magellan Straits in a vessel like that. I believe he must have been very disappointed in this voyage because he does not seem to have come across any of these hazards, but the fact is that the Southern Ocean is a very tough, dangerous sea.

The CHAIRMAN: It is enthralling to hear two men, who have done such things, speaking to us in such simple terms. We congratulate them and we can congratulate ourselves on having brought them here!

THE WRECK OF THE *BETSEY AND SOPHIA* ON ÎLES KERGUELEN, 1831

ANN SAVOURS

ON 20 JANUARY 1832 the *Liberty*, a small sloop of 18 tons, entered Macquarie Harbour, an inlet on the rocky west coast of Tasmania, or Van Diemen's Land as it was then called. She had aboard the mate and fourteen of the crew of the South Sea whaler *Betsey and Sophia*, which was wrecked on the "Island of Desolation" in March 1831. The *Liberty*, whose crew were in great distress from hunger and cold, had been painfully made from the timbers of the wreck and had left Kerguelen the previous December. She had thus sailed nearly 4000 miles across some of the stormiest seas in the world. This paper, from sources in the Tasmanian State Archives, tells the story of this almost unknown voyage and of the subsequent relief expedition from Hobart to rescue the five men left on the island. It is a small contribution towards the history of the sub-Antarctic islands.

The *Betsey and Sophia*, owners Messrs. Barkworth and Co. of London,[1] sailed on a voyage to the South Seas early in June 1830. Her misfortunes began when her master, Captain Thomas Fotheringham, died off the west coast of Africa, from a fall suffered on deck a few days before, during a severe gale. The chief officer, Peter Paterson, took charge and, according to one account, "steered in prosecution of the objects of the voyage for Nightingale and Prince Edward's islands, where he succeeded in obtaining about 40 tons of Elephant oil. They had here, however, the misfortune to lose an anchor and cable, being suddenly obliged to put to sea in a storm for the safety of the ship, leaving part of the crew on shore, whom it was several days after they succeeded in again returning to take on board. At this place also they rescued two sailors who had been left on shore from a former vessel. They then proceeded to Crozet's islands and thence to Desolation or Kerguelen land, in lat 49° S. and long. 70° E. After remaining some time at that dreary place and making several attempts to sail out of Rocky Bay, where they had been at anchor, on the 16th of March 1831, being their fifth attempt, the vessel got entangled in a thick bed of sea weed, missed stays, lost her rudder and in spite of every exertion of the whole strength of the crew in the whale boats drifted to leeward, until forced between 2 rocks in very deep water; she stuck immovably, bruising to pieces at the same time one of the whale boats that lay alongside. She remained in this situation three days until broken by the force of the waves she went to pieces, the hull sinking in 60 fathoms water. Fortunately during this interval they contrived with the remaining whale boats to get the bulk of the provisions and other necessary articles safe on shore, but upwards of 100 tons of oil besides a number of seal skins went to the bottom.

"Here they remained for a considerable time in hopes that some vessel on a similar voyage would call and rescue them from their perilous situation, until the scanty

[1] *Colonial Times* (Hobart) 15 February 1832. Lloyd's Register of shipping 1831 gives as master, Fotheringham; owner, the Captain; 171 tons; built Cowes 1806. Another of Barkworth's vessels, the *Princess of Wales*, was wrecked in 1821 in Îles Crozet. Her crew also built a boat to sail thence, but were rescued just as they were about to launch it. See C. M. Goodridge's account, published Exeter 1832.

remains of the European provisions being nearly exhausted, and depending almost wholly for support on the precarious chance of meeting with birds, shell-fish or sea-elephants, Captain Peterson [*sic*] induced his crew to make an effort to save themselves by collecting such pieces of the wreck as they could find and constructing the little sloop which has now arrived. In these endeavours they had carefully to watch when the sea was smooth in the places where the planks lay at the bottom, and then diving with a pointed steel or chisel in their hand, struck it into the wood, to be pulled up with a cord attached to it by a person in the boat above." Copper bolts were beaten out for nails, and by "unequalled perseverance they at last succeeded in completing the little bark, which they launched on the 22 of last October and fourteen of the crew finally took their departure in her on the 6th of December, 5 preferring to remain behind to take the chance of a vessel calling rather than risk the apparently greater danger of perishing in the long expanse of trackless ocean between Kerguelen's land (about 1000 miles south-west of the island of St. Paul's, so frequently touched at by vessels between this and the Cape)." They made the west coast of Van Diemen's Land on 18 January 1832 and two days afterwards, "being reduced at the time to the last extremity, having only a quarter of a biscuit as the allowance of each per day, they entered Macquarie harbour", where the Commandant of the penal settlement on Sarah (now Settlement) Island, "Major Baylee, of the 63rd. regt. received and comforted them with the humanity and hospitality for which that gentleman is distinguished."[1] Stores were issued by the Commissariat Office and the vessel repaired to sail a further 200 miles to Hobart town. She arrived there on February 14 with her cargo of 130 seal skins and accounts of her remarkable voyage appeared in the local newspapers, from one of which (*The Courier*) I have quoted.

There was concern about the fate of the five men remaining on Kerguelen, with whom part of the scanty amount of provisions had been left. The Lieutenant Governor of Van Diemen's Land, Colonel George Arthur, received an offer from Messrs. Wilson and Hewitt, merchants, to man and provision a ship to be loaned by the Government, provided in return they could keep the money from the sale of any seal skins and oil obtained during the voyage. The Governor approached Captain Dance, R.N., of H.M.S. *Sulphur*, which was then in port, but the latter replied that his orders prevented him from going south. Arthur therefore accepted the merchants' offer and wrote accordingly to inform the Secretary of State in England on 10 April 1832. He received an approving reply from the Under Secretary of State in January 1833. Preparations went ahead meanwhile to equip and supply the Government schooner *Adelaide* of 90 tons. Paterson was appointed Captain. Try-works were fitted on deck and casks for oil obtained. However, Governor Arthur changed his mind, fearing that the voyage might be too much to the merchants' advantage, and decided to auction the *Adelaide* on condition that her purchaser should send her to Kerguelen to rescue the five men. An advertisement of sale appeared in the *Hobart Town Gazette* of May 5, much to the indignation of Messrs. Wilson and Hewitt, who had been fitting out the ship. She was bought, subject to this condition, by a Mr. Petchey, and a long correspondence ensued between the merchants and the Governor about compensation for expenses in wages, equipment and sup-

[1] The penal settlement at Macquarie Harbour, opened in 1821, was closed down in 1833. Luckily for the men of the *Liberty* it was still functioning when they arrived. The Commandant's letterbook of outward letters is in the Tasmanian State Archives (Accession no. 4715). In it is a copy of a letter dated 3 February 1832 from Major P. Baylee to the Colonial Secretary in Hobart Town, describing the arrival of the *Liberty*. The writer states that Paterson tried to make the island of Mauritius (or "Isle of France"), but he found this impossible "and having little provisions, was obliged to bear up for the nearest land".

plies.[1] Meanwhile a violent gale drove the gallant *Liberty* ashore at the end of May in the River Derwent, and greatly damaged her.

Paterson remained master of the *Adelaide* and sailed on 5 June 1832. He returned nearly a year later, on 24 April 1833. A long account of the voyage appeared in the *Hobart Town Courier* of 26 April. Because of the prevailing winds, the *Adelaide* was obliged to take a circuitous route through Torres Straits, landing at the Dutch settlement of Copang, on the island of Timor, for a supply of wood and water. "From Timor they proceeded in as direct a course as the winds would permit to the island of Desolation, or Kerguelen's land. . . . The *Adelaide* arrived at Crozet's islands, considerably to the west of their destination, on the 5th of November. These small islands are not inhabited, but are much resorted to by the fishing vessels in the season, especially for the sake of that large species of seal known by the name of the sea elephant, and which produces so large a quantity of good oil. There are seven islands in a cluster, the largest of which does not exceed 7 miles in circumference. While there Captain Paterson observed a boat at a little distance towing a raft with blubber to some vessels lying off, for these islands afford no anchorage whatsoever. The one called Hog island is the largest, but lying so far to the south it is nearly destitute of vegetation, though it abounds with aquatic birds of all kinds, ducks, petrels, albatrosses, gulls and sea swallows, but no quadrupeds but the seal of the amphibious kind.

"On the 25th January the *Adelaide* came to an anchor in Shoal-water bay, at the island of Desolation, with the two bower anchors, 50 fathom of chain cable each way. Here, however, they could not find the five men, to rescue whom the voyage had been chiefly undertaken, being gone it was hoped on board some vessel that had touched in the mean time. The hut where they had been left still existed, and the remains of a barrel of biscuit, in good condition, were found in it.

"Whilst they continued fishing, however, in order not to return with an empty vessel, it fortunately happened, for the satisfaction of all parties, that the Captain of the vessel who had rescued them, and who had returned to London with his cargo, had again come out in another ship before the *Adelaide* sailed for Hobart town, and confirmed in the conjecture by the following certificate:

"'I do hereby certify, that I took five men off the island of Desolation, 5th March 1832, in the ship *Ocean*, who informed me they belonged to the brig *Betsey and Sophia*, which was cast away upon the said island 16th March 1831; I took the same men to St. Helena and delivered them to the Governor.

Alex. Distant, Master of the barque *Sarah Barry* of London.
Desolation, Feb. 22, 1833'."[2]

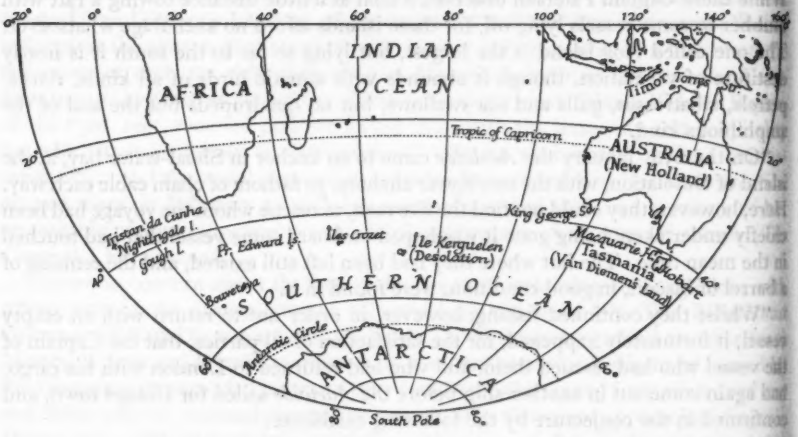
Unfortunately, the *Adelaide* was obliged to return to Hobart without Mr. Byworth, the chief officer. "On the 9th of March last, when the Shallop of the *Sarah Barry*, bringing the above intelligence, came to anchor in the same bay with the *Adelaide*, Mr. Byworth took the opportunity of proceeding in her on her return to the ship, in

[1] See Tasmanian State Archives, Colonial Secretary's Office, C.S.O. 1. 576, no. 13066. Wilson and Hewitt were eventually awarded £80 13*s* 10*d* compensation, although they had claimed £109 19*s* 4½*d*. See also *Tasmanian*, 12 May 1832, for a satirical account of the "Adelaide business".

[2] This was not the first time that Distant had rescued men from Kerguelen. On 15 February 1829, when Master of the *Sprightly*, he picked up the mate and three seamen of the ship *Royal Sovereign*, who had been there for 27 months. I have found no evidence to support both Rhodes's and Villiers's description of the *Ocean* as French. She does not appear in Lloyd's Register of shipping for 1831, but the circumstantial evidence leads one to suppose that she was a London vessel.

order to procure some articles which they stood in need of. On the 10th, however, a strong gale came on from the N.E. and at 4 p.m. they were obliged to let go their third anchor. Two hours after, however, it parted, and the gale increasing during the night, before morning they had parted from both the others, and the vessel drove fast towards the lee beach. For the safety of the vessel and cargo, the master was then obliged to stand out to sea, with the loss of all three anchors, leaving Mr. Byworth on board the *Sarah Barry*, and not being able to lower a boat to get him on board.

"They succeeded in procuring during their stay on the island, no less than 50 tons of excellent oil. On their return they ran very short of water and were reduced to less than a pint to each man a day, and having made the South Western point of New Holland [Australia], they gladly entered King George's Sound to obtain a supply. There running up into a little harbour, they were obliged, having lost their anchors, to make their vessel fast by a rope to a tree, and fortunately met with a settler on shore who gave them what they wanted, in return for which they left 5 cwt of bread, which

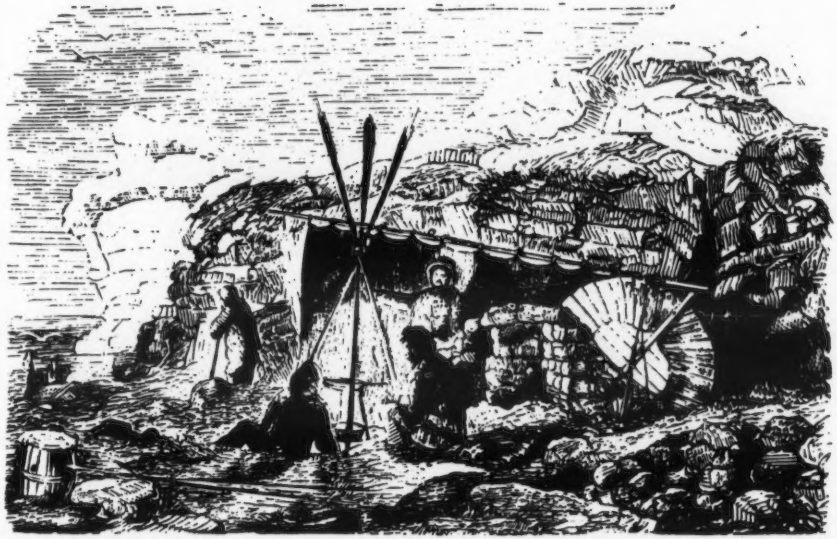


was gladly accepted . . ." The schooner then made her way to Hobart Town, and sailed for the South Seas once more in November 1833, returning in March 1835 with a cargo of oil; master, William Mansfield. It seems almost certain that Peter Paterson continued as master of various other vessels sailing out of Hobart, although the spelling of his name in different ways in records and newspapers makes it difficult to be sure. He probably commanded the *Penelope* in 1834, the *Royal William* in 1836 and the *Emma Kemp* in 1836–9. I have found no evidence to support Villiers's assertion that the *Liberty* became a firewood tender in the Derwent, although it is possible that her name was changed.

I am glad to have the opportunity to record this epic voyage in southern waters "involving as it did initiative and ingenuity to build such a craft from the materials at hand, and indomitable courage to sail her to port afterwards" (Rhodes, 1937).

Acknowledgements.—I have to thank the following: the staff of the Tasmanian State Archives and Captain Harry O'May of Bellerive; the British Federation of University Women and the Council for Commonwealth University Interexchange, without whose studentships this work would not have been possible; the Australian National University for secretarial and other help; Mr. G. P. B. Naish of the National Maritime Museum, Greenwich.

View of the penal settlement at Sarah Island (now Settlement Island), Macquarie Harbour, Tasmania, c. 1833, where the Liberty *arrived in January 1832. From a photo-copy in the possession of Dr. C. Craig, Launceston, Tasmania; artist and location of original unknown*



Men from the Royal Sovereign *on Kerguelen, 1825–29. From John Nunn's* Narrative of the wreck of the *Favorite* on the Island of Desolation (*London, 1850*)

Sources

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This is all in the State Archives of Tasmania, Hobart.

1. Marine Board of Hobart. Report of ships' arrivals, 1832 and 1833.
2. Governor's Office. Duplicate despatches, 33. 10, p. 837–44.
3. Governor's Office. Despatches received, 2, 7. p. 257–8.
4. Colonial Secretary's Office. General correspondence records, 1.576, No. 13066.

Newspapers

Hobart newspapers for the years 1832 and 1833, especially the *Colonial Times*, 15 February 1832 and 30 April 1833; *Hobart Town Courier*, 18 February, 31 March, 26 May and 8 June 1832, 26 April 1833; *Hobart Town Gazette*, 5 May 1832; *Tasmanian*, 18 February and 12 May 1832.

Books and periodicals

Richard Harris, one of the party, made observations on the birds of Kerguelen and the other islands. These were later incorporated in a paper by F. W. Hutton (1865) on the birds of the Southern Ocean, *Ibis*, new series, 1, 276–98.

Brief reference is made to the wreck of the *Betsey and Sophia* and the voyage of the *Liberty* in A. J. Villiers, *Vanished fleets* (London, 1931); also in F. Rhodes, *The pageant of the Pacific* (Sydney, 1937). It is not in Brian Roberts's *Chronological list of Antarctic expeditions* (Cambridge, 1958), although it is now clear that the wreck of the *Betsey and Sophia* should replace the sketchy entry for 1832–34.

ARAB NAVIGATION IN THE RED SEA

G. R. TIBBETTS

THE ARABS have certainly sailed in the Red Sea for centuries, and we possess many scattered references to the navigation of this sea, going back to the time of the Egyptian expeditions to Punt and Solomon's expedition to Ophir. Of course, in Islamic times we have more numerous references, beginning with those about the early Muslim fugitives who took refuge in Abyssinia. The well known travellers, Ibn Jubair and Ibn Baṭṭūṭa both crossed the sea between Jidda and Aidhāb. As soon as there were Muslims in Africa and Somaliland, the Red Sea became important as a pilgrim route. Even Indians and Far Eastern Muslims would prefer this route to the hazardous trek across the Arabian Peninsula. However, it is not until the end of the fifteenth century A.D. that we obtain a detailed view of the navigation of the Red Sea, and this appears in the manuscripts of the surviving works of the pilot Ibn Mājid, the man who was reputed to have guided Vasco da Gama across the Indian Ocean. He, in mentioning the Red Sea as a route, specifically gives two reasons for its importance. The first as a pilgrim route and the second as a trade route bringing supplies to the Ḥijāz from the Yemen and Abyssinia.

At what stage Arab pilots began to write down directions for navigation we cannot tell. Detailed routes by sea to China given by Ibn Khurdādhbih, the *Akhbār al-Ṣīn* and Mas'ūdi may have been taken from written pilot guides, although they may have been recorded from verbal accounts of sailors. Ibn Mājid himself gives in his *Fawā'id* a brief literary history of Arab navigation, or rather a survey of sources known and probably used by him. This account mentions many early navigators, going back into the eleventh century A.D. and a few of them are stated as having written books. However, Ibn Mājid and all these predecessors of his were mainly Indian Ocean sailors. They all seem to belong to one school of navigation connected with the southern end of the Persian Gulf and it is possible that there were many other schools whose works have been completely lost. This school, 'Umānī or Ẓufarī in origin, to which Ibn Mājid belonged, was interested in all the seas navigated by the Arabs but not in the same detail. Surprisingly, there is practically nothing about the Persian Gulf and very little about the Red Sea. Ibn Mājid does give a very detailed account of this sea in one of his texts (the *Fawā'id*) but few of the other texts deal with it and, even in the *Fawā'id*, Ibn Mājid omits it until the end when he adds a special chapter on it, more or less as an appendix to his work.

At the beginning of this chapter Ibn Mājid gives a brief history of navigation in the Red Sea going back about a hundred years and he mentions several pilots by name and one or two works which have dealt with this subject before his time. Among the Red Sea pilots are 'Uthmān al-Jāzānī from Jizan, the Captain (*Rubbān*) Kā'in b. Ḥasan al-Mahā'imī (from a Yemeni tribe), Muḥ. b. Marā al-Iskandrānī, and Maḥmūd al-Tha'ālibī, who was probably from al-Lith, for Tha'ālib was a tribe on the sea coast between Jidda and al-Lith which owned, or had fishing rights in, the islands as far south as Ẓahrat al-Qaṣr. But these were contemporaries from whom Ibn Mājid obtained information and there is no sign that they wrote anything. He also mentions obtaining information from the people of the island of Jebel Sabaya, who must have been a fishing community acquainted with the neighbouring coastal bank. Apart from these, Ibn Mājid takes his information from works of his father and grandfather who sailed in the Red Sea before him. His grandfather (presumably Muḥammad b. 'Amr al-Sa'dī) "was experienced and well-versed in this sea", to quote Ibn Mājid, "and had no equal". But that is all we hear of him; no works are actually named. His father, Mājid b. Muḥ. al-Sa'dī was even more experienced. His exploits are quoted in several places in Ibn Mājid's section on the sea in the *Fawā'id* and several times the accuracy

of his information is stressed. The works of his which are particularly mentioned in connection with the Red Sea are *al-Hijāzīya* and an *Alfīya*.

Of the works of Ibn Mājid himself which mention the Red Sea, his one main prose work, the *Fawā'id* (Bibl. Nat., MS. Arabe 2292 f. 1–88) contains the fullest account of navigation there. In addition sections occur in his poems *al-Ḥawīya* and *al-Mekkīya* and in a poem in *Tā'* recovered from Leningrad by T. A. Shumovsky. Also in the *Fawā'id* he quotes his poems *al-Dhahabīya* and *al-Sab'īya* in connection with the Red Sea. In the latter he gives the *qiyās*[1] measurements of some of the important places in the sea according to several well known stars, but in the former poem Ibn Mājid only uses several places in the Red Sea as isolated examples and they do not appear in any context.

After Ibn Mājid, Sulaimān al-Mahrī, writing sixty or so years later, mentions the Red Sea in detail in his *'Umda* and gives its latitudes (*qiyās*) when generally dealing with latitudes in both the *'Umda* and the *Minhaj*. Sulaimān does actually integrate the Red Sea with the rest of the Indian Ocean, but in the *Minhaj* only when dealing with latitudes; elsewhere he omits it. In the *'Umda*, however, it seems to be mentioned as fully as most other areas. Latitudes and the main routes are given in their proper places and a rather full description is given of the islands off both coasts which are furthest out to sea, starting from the south and working towards the latitude of Jidda. Sidi Çelebi, a Turkish navigator, wrote a work which is mainly a translation of that of Sulaimān and as such contains practically no new material and so is of little interest to us here.

The general conception of the Red Sea in the texts of Ibn Mājid and Sulaimān is not so accurate as one might think compared with their accuracy on the other coasts of the Indian Ocean, although this is in accordance with the fact that they neglected the Red Sea and that their knowledge of it seems to have been rather less. The captain who sailed the deeps of the Indian Ocean would find it much easier to sail down the centre of the Red Sea, as far as possible from all the treacherous banks and reefs near the coasts. Thus coastal details are almost completely lacking in their works. Places on the coast are mentioned in their latitude tables, therefore at regular intervals up the coast, but they are very rarely connected by means of bearings, so it is impossible to plot them as one can the coastal features, for example, of the Malabar coast. Thus an attempt to plot a chart of the Red Sea using the two "coordinates" of these navigational texts, Pole Star altitudes (latitudes) and compass bearings, produces positions for the most important islands in the centre of the sea together with several different routes through the central part. Islands on the edge of the coastal shelf and nearest the deep sea are used as guides, and bearings are usually given to and from them, so that it is possible to plot them on the chart. Bearings to islands nearer the coast are rarely given. Directions such as "towards the north and the coast" or "towards the south and the west" are much more usual for these, distances being rarely given. Bearings are only extremely rarely given on coastal features so that on a map coastal features have to remain conjectural. Jidda, Bāb al-Mandab and Kamarān are the only places that can be plotted without using guesswork and as these are all on the Arabian coast, the Sudanese coast is left completely conjectural. Even Suakin can only be placed by its latitude, for in entering or leaving its harbour the only bearing given is due east or west which is useless for plotting.

Having plotted a map it is noticeable that all the bearings are given too much to the south and east (i.e. anti-clockwise from the true bearing) so that the axis of the sea lies at an angle of about 35° to the parallels of latitude, whereas in actual fact the angle should be about 25°. This tendency is found in all the measurements of bearings given by the navigators, although it is much more exaggerated in the Red Sea. The cause for it cannot be explained. In addition, the measurements of Pole Star altitude (*qiyās*) given by the navigators for a single place vary considerably and so make the attempt to

[1] *Qiyās* is the name given by the Arab navigators for the measurement of the Pole Star's altitude in any place. This was used by the navigators for all practical purposes instead of latitude. Corrections were made for the Pole Star's revolution round the Pole.

find actual values from the text extremely difficult. This again happens throughout the Indian Ocean. Once the Pole Star rises more than eight *isba'* [1] above the horizon, the various texts have a great number of variations and even the same author has different values in two different texts. Sulaimān in his *Minhāj* gives maximum values and

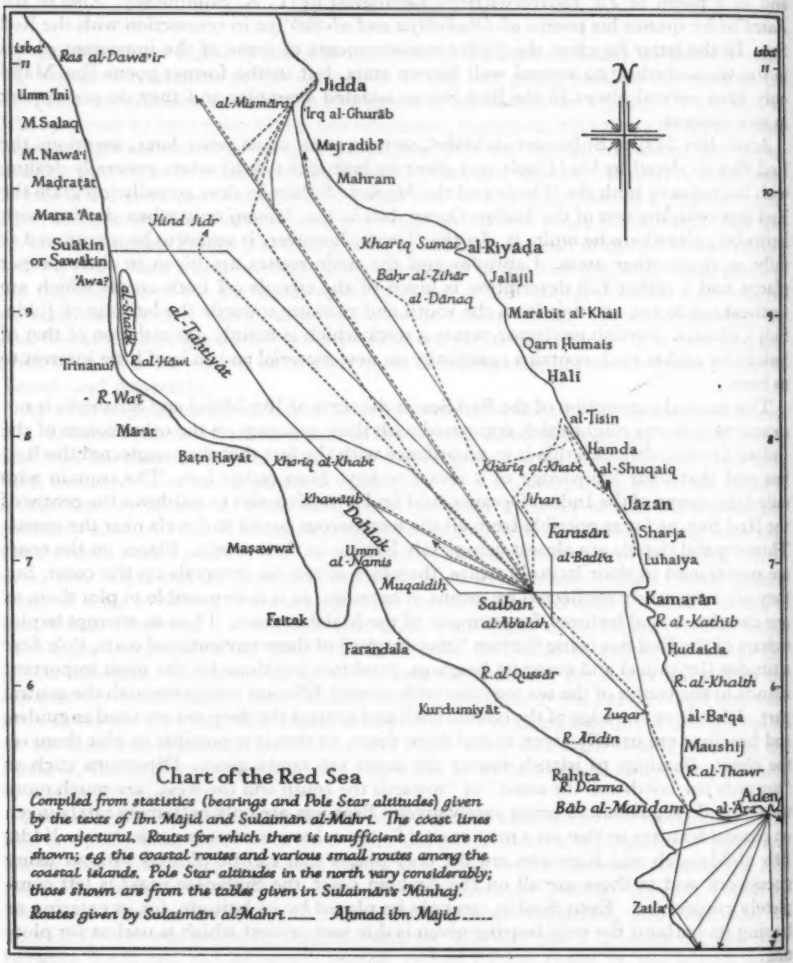


Figure 1

in his *'Umda* minimum values; usually Ibn Mājid's measurements fall somewhere between the two extremes. Actually the higher values of the *Minhāj* give a more accurate picture of the Red Sea. Ibn Mājid in his *Fawā'id* apologizes for the inaccuracy of *qiyās* measurements in the Red Sea, indicating that it was impossible to measure accurately from the Pole Star so that his measurements could never be as

[1] Pole Star altitudes were measured in *isba'*, i.e. fingers, supposed to be the angle made at the eye by the thickness of the fingers held at arm's length. There were 224 *isba'* in 360°.

accurate as those taken in the Indian Ocean. This implies that the Pole Star was used in similar latitudes in the Indian Ocean but could not be used in the Red Sea and that Indian Ocean measurements were accurate. But this is not the case. The *'Umda* and *Minhāj* measurements differ just as much on the Gujerati coast as they do at the same latitude on the Arabian coast of the Red Sea.

According to Ibn Mājid in the *Ḥawīya* there were five routes through the Red Sea. The two coastal routes sailing between the coastal reefs and the actual coast, the middle route without sighting land and the other two going from island to island off either the Sudan or Arab coasts. The first two were mere child's play; the routes taken by the *Rubbān*[1] of the coast but "not the path of the true navigator". The real *mu'allim* sailed up and down the middle of the sea and only moved towards the coast when in the correct position to sail straight into the harbour desired. However, it must have been the last two routes that the majority of *mu'allims* used for it is on these that the navigational texts have the most to say. By sailing from one prominent island to another near the edge of the deep sea, the pilot could keep constant track of his position, without getting entangled in the numerous shoals nearer the coast. Thus, in unforeseen circumstances such as a storm or sudden contrary winds (both frequent in the Red Sea), he would be free to anchor in some fairly safe place or to go safely out to sea without any great effort, until the danger was over.

Ibn Mājid mentions that these routes worthy of the *mu'allim* vary with the season and to some extent with the whim of the navigator, also there were old routes which were not used in his day. The oldest way known to Ibn Mājid for the central route was to sail SW. for a day and a night from al-Mismāra, a well-known shoal to the south and west of Jidda, and then to turn SE. or SE. by S. until Saibān (i.e. Jebel el Ṭair) was sighted.

This oldest route, according to Ibn Mājid, was usually used about the beginning of August, i.e. when the north-westerly winds were well established. Later, in the days of the Sharīf Barakāt, A.D. 1426–55, ships used to set out from Jidda at the end of January, i.e. when winds were fairly steady although the prevailing wind in the south was from the south-east. Then they set a more southerly course (SW. by S.) until they were well out to sea (actually 7 *zām*)[2] and then sailed SE. by S. (28 *zām*) to Saibān (Jebel el Ṭair). On this route they made a point of sighting the African islands before Saibān. Presumably the old route was still used in the summer, the winter route being an innovation about A.D. 1430–50. In the time of Ibn Mājid it would seem that the old routes were still in use, but a large number of variations and fine distinctions had come into being.

From the combined texts it would seem that ships preferred the Sudan coast because of the large number of shoals on the Arab side. West winds (*'Awālī*) were likely to blow up at any time and if the boat was too near Arabia there was a tendency to be blown among these shoals. When the African islands had become well known, ships tended to sail as far west as possible and when sailing from the north a knowledge of the important seaward islands of the Dahlak Archipelago enabled one to bear on Saibān (Jebel el Ṭair) which was the focal point of all Red Sea sailing.

South of Saibān everything was simple. From Saibān one aimed (SE. by S.) for al-Ab'alah (Zubair Is.) and from there to Zuqar and then to the "Bāb".[3] The only dangers were in the immediate vicinity of Zuqar, or if one went too far to the east one could strike the coast near Mocha (Ras al-Thawur). Routes are given to Kamarān from Zuqar for here the coastal route started which inferior pilots (Ibn Mājid is very scornful of them) used, calling at Luḥaiya, Jizan, the Widan area and Riyāḍa (al-Lith).

[1] *Mu'allim* was the title of Ibn Mājid and Sulaimān, the men who navigated the oceans. *Rubbān* was the man in charge of any boat, including fishing boats and coasters, and was despised by the *mu'allim*.

[2] The *zām* was of two sorts, probably originally identical. It was either three hours' sailing, or an eighth part of an *isba'*. The former must be meant here.

[3] "The Gate." Sulaimān and Ibn Mājid nearly always refer to Bāb al-Mandab simply as the Bāb.

When sailing north all routes radiated from Saibān. Due east brought you to Kamarān and the coastal route to the north. Bearings towards the north (N. by W.—NNE.) brought you to various points in the Farasān islands, either for sailing north-west along the coastal shelf to Jidda or for attaining the coast north of Farasān. The safer route was to aim between west and north-west towards the outer islands of the Dahlak archipelago, which were high and rocky and therefore easy to pick out. Once in sight of these one followed the African islands as far as Hind Jidr or until one reached a certain latitude and then turned east for Jidda. Finally, daring pilots like Ibn Mājid sailed north-west (or NW. by W.) directly from Saibān and without sighting land turned eastward at a recognized latitude. According to Ibn Mājid this was the route all good navigators should take, but the eastward movement towards Jidda either from mid-sea or from the Sudanese islands seems to have been a very hit and miss affair in spite of the exact directions given. Fortunately, the Arab coast was fairly safe in the latitude of Jidda and the coast could be identified before serious dangers were encountered. On the return journey from Jidda various methods were employed to enable the ship to reach open sea, so that a simple bearing for Saibān could be taken. It is obvious, however, that things were not as simple in practice and the tendency was to aim too far west so that the Dahlak islands were sighted. Once these were identified a correct bearing could be taken for Saibān. As the *qiyās* of Saibān was known accurately there was no danger of sailing past it and if, when approaching the right latitude nothing had been sighted, it was best to sail west, find and identify one of the Dahlak islands and then set a bearing for Saibān.

The winds, of course, were the greatest hazard of the Red Sea. The prevailing wind north of the 18th parallel is a north to north-westerly wind, but south of this latitude the wind blows from the same direction during the summer months and from south to south-east in the winter. Thus north of al-Lith the winds are fairly constant but further south there are periods of change-over in the spring and autumn. Thus the navigators sailed by the north and south winds and found cross-winds (usually from the west) difficult to deal with. For this reason, i.e. the sudden appearance of a westerly wind, they kept clear of the reefs off the Arab coast and preferred to sail nearer to the coast of the Sudan. Land and sea breezes, known as *al-Ṣauram*, are also mentioned by Ibn Mājid, who says they were more obvious on the African side, and could be used to advantage by sailors. The north wind (*al-Shamāl*), however, was always uppermost in the minds of Red Sea navigators for its strength varied at all times, and when sailing northwards towards Jidda it had to be encountered at some time or other. Thus throughout Ibn Mājid's text there appear notes on what to do in certain places when the north wind begins to blow. Presumably the ships had to tack to work their way north against this wind but this is not clear. It is clear, however, that the manœuvre known as *takkīya* was resorted to. A large proportion of the space devoted by the navigators to the Red Sea is given up to this method of *takkīya*. Sulaimān devotes a whole section to it in his '*Umda*. But nowhere is the technique of *takkīya* described; Ibn Mājid mentions employing it in various situations but none of them are extremely clear. Sulaimān's section from the '*Umda*, which is more or less a table of *takkīya* positions, gives a series of positions at $\frac{1}{4}$ *isba'* intervals, in each case showing which islands will be sighted when turning in towards the coast from the position given. In every case two islands are named—one when the north wind is strong and one when it is weak. The latitudes are given in value of both Pole Star and α Crucis altitudes, as a safeguard against the uncertainty of measuring latitudes in the Red Sea.

The basic meaning of the word *takkīya* (if it is derived from *waka* وكى) is to recline on one side when sitting on a divan on the floor, and the root probably becomes associated with leaning on the steering oar to cause the boat to incline. Thus it is possible that the word becomes used for some process such as tacking against the wind. Ibn Mājid refers to *takkīya* while among the islands of the reefs almost as if *takkīya* meant "to tack". However, in these texts it is used to refer to proceedings against the prevailing north wind in the Red Sea. Sulaimān al-Mahrī gives a complete table of

takkīyāt for both sides of the Red Sea. He explains that *takkīyāt* are due to variations of the north wind, so that if you sail NW. up the centre of the Red Sea and then aim towards the coast from a fixed latitude you will arrive at different places depending on the strength of the north wind. With a strong north wind the direction taken to the Arab coast is E. by N. or due east, and to the Sudan coast, WSW. or SW. by W.; with a weak north wind the directions are NE. or NE. by N. to the Arab coast and due west to the Sudanese coast. It is not clear whether these directions are forced on the captain by the wind and no alternatives are possible, or whether the captain chooses them as the most acceptable in the circumstances, although a note at the end of the tables says that these *takkīyāt* are conditioned "by the north wind's striking you while you are halfway between the two coasts and you cannot reach land except in the places mentioned". This would indicate that the captain had no alternative, but it seems odd that he should be incapable of steering his ship into the wind and at the same time making allowances for its strength.

These tables show that a fixed course must have been taken, presumably the more northerly one, and the effect of the wind was calculated so that a captain wishing to make a certain island sailed to the north-west in the centre of the sea until he reached the latitude which the strength of the wind suggested to him to be the correct one to enable him to make his harbour. Another theory would be that captains sailed north with a favourable south-west wind (October to April) knowing that at some time they would meet the prevailing north wind of the Red Sea. When they met it they knew from the tables where they were likely to be if they turned towards the coast. Then, once near the coastal islands mentioned by the tables, they would continue to battle their way north against the wind by dodging among the islands, taking shelter when they thought the wind was too strong for them. In this case *takkīya* means a general scurry for the shelter of the coastal banks as soon as the north wind was reached.

Ibn Mājid's many disconnected sections on sailing against the north wind show that his text has incorporated a table of *takkīyāt* similar to that of Sulaimān. When he refers to the amount of *takkīya* he connects it with the strength of the north wind and shows that it is the amount which one is retarded from making progress to the north in the face of this wind. Ibn Mājid, however, uses the term *takkīya* not only for the general making for shore from the centre of the Red Sea but also for smaller journeys in the coastal areas. Thus he talks of *takkīya* from Baḥr al-Ẓihār to Sha'b Sulaim and it is here that the phrase may have the meaning "to tack", for it implies arriving at a fixed destination (Sha'b Sulaim) from a fixed departure point after going different distances (it could be intervals of time) under different wind conditions. The general direction of the journey is fixed (N. by E.) and directly is under a *zām*, but by *takkīya*, with a weak north wind, it is 2–3 *zām*, hence some sort of dog-leg must have been used. In other places *takkīya* can almost be translated "incline", especially when a direction is given like "*takkīya* to the ENE.", but underlying the phrase is always the strength of the opposing north wind at the time. When leaving the Faṣalīyāt, Ibn Mājid "*takas* over" them until dawn when he anchors. *Taka* here may mean "to tack" or may mean "to incline", the preposition "over" (*'ala*) cannot mean very easily to the leeward of them (rather the opposite), but it should be noted that he prefers to anchor until the wind is less strong.

These *takkīya* positions, latitude (star altitude) positions at regular intervals from north to south and bearings given for the main routes up the centre of the Sea, are all that these texts give about the Red Sea except a short section on the most seaward islands in the *'Umda* and the last section of Ibn Mājid's *Fawā'id*. Compared with the *Fawā'id* the *'Umda* gives very little detail and it is best to discuss the *Fawā'id* and only mention the *'Umda* where it differs from or adds to the text of the other.

As I have mentioned before, the *Fawā'id* reserves a special chapter (No. 12) for the Red Sea at the very end, almost as an appendix. Thus, when dealing with latitudes across the world from east to west, the *Fawā'id* comes to a stop at the south and east coasts of Arabia where other texts go on to the Sudan coast. The *Fawā'id*, in its usual

unsystematic way, then goes on to give details of the sea exceeding all the other texts together although it does not give a detailed list of latitudes, only giving them when they are considered necessary for defining an actual route. The text begins with a description of the voyage from Jidda to Saibān and the author, often losing himself in trivialities, returns to continue the voyage to the "Bāb", then sections follow on the

Figure 2

shoal of Shaʿb ʿĪsā with a list of turbid areas and other odd dangers. The Sudanese islands are then mentioned, comparing features on both sides of the sea, and this is confused with a description of the Arab coast, especially of the entrance to al-Lith. Then he mentions the four channels through the coastal shelf on each side. After further sketches of routes in different parts, a detailed description of the Farasān islands is given, followed by the shoals to the north as far as al-Lith—what is now

termed the Farasān bank. Finally, a brief résumé of the Sudanese islands from the south, with a description of the crossing to Jidda, brings the chapter to a close.

As I have said before, the coastal features mentioned by the Arab navigators in the Red Sea are relatively few. It is quite obvious that the coasts were known to them for they give complete lists of places, mentioning one place for every quarter of an *isba'* in Polar Star altitudes, but they had no practical need for these places and so wrote nothing about them. On the Arabian coast nothing appears to the north of Ras al-Qaḥḥāz, the northern cape of the bay of Jidda, but from Jidda itself down to the neighbourhood of al-Lith, Ibn Mājid's *Fawā'id* gives a wealth of detail. More than ten coastal localities are mentioned, probably fishing villages with small harbours, nine of which appear on the International 1:1M. map and are presumably in existence today. In addition a number of mountain features are mentioned in the interior. All this detail is due to the fact that the coastal shelf in this area is narrow and most of the banks and reefs, being strung out in one long line, are named after villages or other features on the coast. The deep sea is not far from the coast and the mountains of the interior are high and can therefore be used as landmarks from the sea. Furthermore there are two channels through the coastal shelf which can be negotiated by using these mountains as landmarks. Further south, where the coastal shelf (today called the Farasān bank) widens, references to the coast are entirely lacking; the town of Qunfidha, which certainly existed at this time, is not mentioned by these navigators at all. Al-Lith, another harbour of importance, appears in these texts under the name of al-Riyāḍa. It was obviously of importance then as it was opposite one of the passages through the coastal shelf (called by Ibn Mājid, Kharīq Sumar after the island still called by that name near the harbour of al-Lith) and Ibn Mājid allots much space to the description of this channel. On the other hand Qunfidha is not opposite a channel and can only be of use for coastal traffic. Ḥālī is the next important place to the south of Qunfidha and is mentioned once by Sulaimān. At other times he mentions al-Jufūf (al-Jahfūf on modern maps), the name of the bay on which Ḥālī is situated, as if no actual town existed. Ibn Mājid does not mention it at all. The coastline south of Ḥālī was dealt with in more detail because it is closer to the next channel through the coastal reef, Kharīq al-Khabt (north of the Farasān islands). This channel has no very good harbours opposite it, so that traffic either sailed along the coast northwards towards Ḥālī or southwards towards Jāzān (Jizan), so that between these two places we are given the names of all the more important villages and inlets. Seven names appear both in the texts and in the International 1:1M. map, indicating that few names have changed in the last five centuries, and it is possible that the places marked on modern maps, where the navigators leave blank spaces, existed in those days in the same precarious way as they do today on that inhospitable coast. South of Jizan, Ibn Mājid mentions a coastal route to Luḥaiya but no coastal details are given except al-Sharja which seems to have disappeared. Beyond Luḥaiya where the coast is more accessible one would expect more detail, but apart from the regular latitude measurements there is nothing. Once south of the latitude of Saibān (Jebel al-Ṭair) the navigators headed for Bāb al-Mandab, and when returning from the "Bāb" aimed for al-Zuqar and then for Saibān without touching the coast. Ibn Mājid in his *Ḥawīya* mentions the dangers of going too close to the Arabian coast near Mocha. Ḥudaida and Mocha are both mentioned in the texts; they must have been fairly important ports but were not frequented by our navigators.

Similarly, on the African coast coastal features are given regularly in the latitude measurements, but they do not seem to be important enough to receive much attention. Arrangements for entering Suakin are mentioned by Sulaimān but not by Ibn Mājid. The navigators are only interested in the outermost islands. The only places actually on the coast that Ibn Mājid mentions are 'Aqīq and Jebel Erba, the latter behind the modern village of Muhammad Qol near the Sudan-Egyptian border, which he uses as a landmark for turning from the Sudan coast in order to reach Jidda. Maṣawwa' is mentioned by Sulaimān in the latitude tables. Arquiqo and Adulis (Zula) are not mentioned nor is Aidhāb. North of the latitude of Jidda and on the Sudanese coast,

Ras Dawā'ir is the only place mentioned by the texts, except that the *Ḥawīya* mentions Quṣair and features in the extreme north around the Sinai peninsula.

The Red Sea is noted for being difficult to navigate because of the large numbers of reefs and shallows which abound off both coasts. Ibn Mājid's account in the *Fawā'id* brings out the nature of the sea excellently. He explains that off both coasts of the sea and parallel to them runs a coastal shelf (*amrīya*) which is continuous roughly from the latitude of Jidda (actually from Hind Jidr on the African coast) to the end of the Dahlak islands on one side and to the Kamarān islands on the other. Between this coastal shelf and the coast itself there is a continuous passage for ships wishing to visit coastal villages. At least this is obviously so on the Arab side from Ibn Mājid's text, but his account of the Sudan coast is short and does not show this. The coastal shelf itself, according to him, consists of sand on the Sudan side and sand and pebbles (stones) on the Arab side. Ibn Mājid mentions that the coastal reefs on both sides are divided into sections by channels (*kharīq*) which are navigable. Here ships may pass from the deep sea (*al-bāha*) to the coast. On each side there are four channels, each one symmetrically opposite one on the other coast. But this logical arrangement breaks down when it comes to a detailed description.

On the Arab coast these channels are: 1. Al-Khabt between the Farasān islands and the al-Faṣaliyāt shoals, 2. the Sumar channel opposite al-Lith, 3. another slightly further north opposite the villages of 'Umair and Sharja and 4. the entrance to Jidda harbour. Ibn Mājid's text is corrupt in this portion but although he numbers his four channels, he actually gives five and the first, as I read his text, is over Ḥudaida, i.e. at the extreme southern limit of the coastal shelf. Furthermore there are two more channels opposite Mustabiṭ to the south of Jidda which he describes in detail in another portion of his text, although one of these may be the same as the one over 'Umair and Sharja mentioned earlier. On the Sudan coast his count of four falls short. He can only find two channels. The Kharīq al-Khabt is supposed to be opposite the channel bearing the same name on the Arab side, but actually it is the gap between the Dahlak and the Suakin archipelago. The only other channel mentioned by Ibn Mājid is that north of Hind Jidr, in other words the passage round the north of the coastal shelf. The passage round the southern end of the Dahlak islands to Massawa' is not mentioned.

Of the islands themselves, far more detail is given for those on the Arab side, particularly those between the Sumar and Khabt channels, i.e. on the Farasān bank between al-Lith and the Farasān islands. This area was described by Sulaimān in a certain amount of detail in a section entitled the "Islands of the Arab coast of the Red Sea". Ibn Mājid also gives a complete account of them, but adds considerably more detail in the north when describing the various ways of approaching the harbour of al-Lith. The general tendency is to give details of those islands nearest the open sea and neglect others nearer the coast, but when putting the various texts together a good over-all view of the coastal shelf is obtained. The account is far more detailed than that given in modern European pilot guides. The Red Sea Pilot and the International 1 : 1M. map both have an empty gap to the south of the island of Sirrain (Saran) and north of the islands of Tedkar and Doshakiya; both Arab authors have quite a few extra names here. It is possible that the shoals have disappeared from this area. Ibn Mājid mentions that some shoals have disappeared in the century immediately before his time and some have built up, some shoals becoming islands even with vegetation on them. This of course may be one of the reasons why these authors place shoals where nothing can be found in the present day guides, but the large area mentioned above is unlikely to be as completely free from dangers today as the modern aids to navigation would suggest and this almost certainly shows a gap in modern knowledge of the area.

The names of a large number of the islands and shoals in this area bear the same names today or names with some resemblance to those mentioned by the navigators of the fifteenth century. Compared with the names of features on the coast, the resemblance is surprising. The reason for this is that the names on the coast are of secondary interest to sailors (except actual harbours), so that only selections of names are chosen

by both Arabs and Europeans and coastal names rarely occur in more than a single text. The islands on the other hand are all of fundamental importance to a sailor, for he may run upon them at any moment, and are therefore listed, their importance being the same for all who come upon them. Another interesting feature with regard to nomenclature is that islands having perfectly plausible Arabic names on modern maps such as Sha'b al-Saqa, Shaker, Tedkar, Abu Lāt bear slightly different names in the navigational texts which have a completely different origin, e.g. Sha'b Zuqar, Shīka, Tajda and Abalāt. It would be interesting to discover what were the names given to these islands by the inhabitants of the Arab coast, both today and in the days of Ibn Mājid. Do the Arabs still use the same names or have they changed in local toponymy?

The names given by Ibn Mājid and Sulaimān contain several elements which must refer to geographical (hydrographical) terms, some of which are still used and some whose precise meaning has been lost. *Qiṭ'a* (pl. *qiṭa'*) "reef" (both forms are used more or less indiscriminately by Ibn Mājid) is still used by Arabs today but only in proper names; Ibn Mājid occasionally uses it as a geographical term. The term given by the Red Sea Pilot for reef is *sha'b* and this occurs often as a term and also in combination in proper names. Both *qiṭa'* and *sha'b* seem to be used for a reef and the exact difference between the two is doubtful. In one case *qiṭa'* is used for the same feature as *'irq*, which is described as of sand. *'Irq* is a term used in the desert for a long ridge of sand dunes and is presumably used by navigators to explain a similar feature on the bottom of the sea. *Wuṣūl* (sing. *waṣl*) are sandy shoals described in one place by Ibn Mājid as being of *turāb* (dust). Another term which is common in this area but is difficult to define is *ẓahra* (pl. *ẓihār*). The only explanation which seems to fit this term is that of "islet". As far as I can see there is no real difference between places termed island (*jazīra*) and places termed *ẓahra*. However, *ẓahra* is usually used in combination with the proper name of some other island not far away. Thus we find Samir and Ẓahrat Samir; Marma and Ẓahrat Marma (Dohra on modern maps), usually described by Ibn Mājid as "Marma and its Ẓahra". In most cases these two islands are close together and might be recognized as companions, but occasionally there are other islands in between as in the case of Ablaj and Ẓahrat Ablaj. *Ẓahra* is also used as a technical term and other islands besides those named as such are described as a *ẓahra*, in fact Marma given above is a *ẓahra*. The four islands which include al-Jadīr, al-Maṭāṭa, Marma and its Ẓahra (the present day Jadir, Malathu, Marmar and Dohra) were known to the navigators as the four Ẓihār while Jadir is known as Baḥr al-Zihār, i.e. the one nearest the sea. Ibn Mājid uses the root *ẓahara* to mean appearing from the sea, in the sense of a shoal being built up into a permanent island. A *ẓahra* is probably the result of such an action. Islands were occasionally formed on this coastal shelf and occasionally disappeared again, according to Ibn Mājid and, in actual fact, reefs are continually being built up along this coast. *Ẓahra* is certainly not used to describe all reefs in the sea and it is possible that these *ẓahras* were built up within the memory of the navigational traditions of this area. On the whole, however, Ibn Mājid's terminology is so vague that we can do little more than identify *ẓahras* as low islets uncovered in all conditions of the sea and occasionally (perhaps always) possessing vegetation of some sort.

Also worthy of note in this section on the Farasān bank are the latitude discrepancies. Sha'b 'Īsā, a sunken reef and Ṭiḥāl Marīr (?), a discoloured patch of water, lie in the neighbourhood of al-Zuqāq but are consistently mentioned as being on the same latitude as Jabal al-Ṣabāya or said to be seawards of it. A modern chart will show how far apart are the island of Jebel Sabaya (off Ḥālī point) and al-Zuqāq in latitude and how simplified is the description "to the seaward of Jabal al-Ṣabāya" given by Ibn Mājid. This discrepancy of latitudes between the mainland with other features on the coastal route, and between the islands on the coastal shelf approached from the open sea, must be due to the fact that no one crossed the coastal shelf directly. Ibn Mājid says that he received his information about Sha'b 'Īsā from people on Jabal al-Ṣabāya who were probably local fishermen. Presumably, therefore, local fishermen never crossed directly from the Ḥālī region to the open sea, but must have passed along the

coastal channel until they reached one of the *kharīqs* and then made their way along the edge of the coastal shelf until they reached fishing grounds on the same latitude (or so they thought) as their home town. Fisherfolk would not bother to measure latitudes, and so their error became incorporated into the navigators' texts, producing a corresponding error throughout this part of the Farasān bank.

Attempts to enter the harbour of al-Lith, which is known as al-Riyāḍa by the texts, are given in great detail, although not too clearly, by Ibn Mājid, this section being part of the general *takkīya* directions showing which islands to sail between in different wind strengths in order to reach the harbour. North of al-Lith and between it and Jidda the coastal shelf is narrow with a single line of reefs, although it widens as it approaches al-Lith. The reefs in this section are always said to be "over" a particular town on the mainland and this makes the description so much simpler. In fact quite a few of the reefs take their names from the villages on the coast which they are opposite. Ibn Mājid spends some time describing the channels over the bank opposite al-Mustabiṭ and Shuwāra using the mountain features of the highlands on the mainland as landmarks, as I have said before.

South of the Khabt channel the islands of the Farasān archipelago are dealt with in some detail. Here the same tendency occurs to describe those islands nearest the sea and those on the north bordering the channel, but to neglect those which are not really important for shipping. Ibn Mājid states that all the islands in the middle (presumably meaning the middle of the archipelago) are beyond number and then dismisses them saying that they are free from danger (which is doubtful). The channels which Ibn Mājid defines around the Farasān islands are the seaward side of the Farasān bank and along the north of the islands, i.e. via the Khabt channel to Jāzān (Jizan). Details are also given down the coast from Ḥālī, sailing both sides of the island of Ḥadhyān or Firān towards Jizan. From the last mentioned place Ibn Mājid mentioned a route following the coast to Luḥaiya. In addition he attempts descriptions of tricky routes across the coastal shelf (Farasān bank) in the neighbourhood of the Jihāns (Kabīr and Ṣaghīr) and also states that there was a route between Sāsūh and the Jihāns, i.e. to the west of Sāsūh. Modern Pilot guides say there are no routes across the bank and the only route in this area, certainly the only north–south route, goes down the inner edge of this bank between Saso (Sāsūh) and Disan. Although the identification of these islands is doubtful, Ibn Mājid certainly puts this route west of Sāsūh and not to the east as the modern guides imply. Ibn Mājid never mentions the route used today to approach Jizan from the south through the "Pearly Gates" between Dohrab and Marrak, which I would identify with Ibn Mājid's Dhu Kharab and Dhu Thalath.

The islands off the Sudan coast are actually concentrated into two archipelagoes: that of Suakin and that of Dahlak. The Arab navigators, especially Ibn Mājid who liked to see symmetry wherever possible, imagined a coastal shelf extending down the coast with certain channels through it exactly opposite similar channels on the Arab coast. Thus he separates these two archipelagoes, called Dahlak and al-Taḥtiyāt by him, by a Khabt channel similar to his Khabt channel on the Arab coast, although in actual fact there is a distance of almost $1\frac{1}{2}$ degrees between the two groups of islands. The islands described by the navigators are those on the north and the east of the groups, that is, those with which they were more likely to come into contact. Also there is a surprising resemblance between the names given to the islands by the navigators and the names they are given in maps today (approx. three-fifths); far more so than on the Arab coast. The islands on the south and west of the Dahlak archipelago are not mentioned nor those inside and to the north of Dahlak island. Similarly some of the south-westerly islands of the Suakin archipelago are omitted, but this archipelago being more open and free from snags was known more thoroughly by the navigators, also Suakin itself was approached from both sides of the archipelago. As Massawa does not seem to have been used by them this partly accounts for the ignorance of the Dahlak archipelago. Sulaimān al-Mahrī gives the most complete list of the Sudanese islands in various sections of the *'Umda*. Ibn Mājid skips over the Suakin group with the mere mention of Hind Jidr, Bār Mūsā and the Taḥtiyāt, which were in actual fact

not the whole archipelago but the close group of islands on the south-east of the archipelago and north of Dahrat Abīb.

These were of course the most important islands in the group for the pilot who was sailing close to the Sudan coast but really making for Jidda. Ibn Mājid's goal was always Jidda. He never mentions Suakin, although he does mention ʿAqīq, a harbour on the coast screened by the archipelago. Similarly Ibn Mājid only has need of certain islands in the Dahlak archipelago. To a man sailing from or to Jidda, using the centre of the Red Sea, it is only those islands in the south-east which are important for navigating. They approach nearer to his route and are high and rocky, whereas most of the other Dahlak islands are low and sandy. Thus the Khawāṭib are the most northerly ones he mentions except for a solitary reference to the Rumiyāt which are on the edge of his Khabt channel. The Khawāṭib were actually low, sandy islands but to the south of them the high, rocky islands began. These were known to him as the Ḥajawāt (perhaps Ḥajarāt, "the rocks") and were used exclusively as a guide for Saibān (Jebel el-Ṭair) or as an indication when to turn north-west after leaving Saibān. Muqaidiḥ (modern Mojeidi), the island nearest Saibān and Aukān (Aucan), a larger island a little to the west, were especially important. Harmil (Armil) the large, low island in the north-east of the archipelago had no interest for Ibn Mājid, although Sulaimān mentions it as the first one that you come to when sailing south towards Dahlak.

South of the latitude of Saibān, the islands of the Red Sea are concentrated in the middle and leave the coasts fairly clear. As the navigators stuck to these central islands, most of the details are given about them. Saibān was the most important, being high and rocky and having no shallows around it. From this island routes radiated to the north, but to the south there was only one recognized route, to al-Abʿalah and then to al-Zuqar and Bāb al-Mandab (called Bāb al-Mandam by the texts). Details are given of one or two reefs in the neighbourhood of al-Abʿalah (the Zubair islands) and Ibn Mājid loses himself in a description of Rishsha and Umm Shaiṭān between al-Abʿalah and Kamarān. Zuqar is mentioned very shortly and no indication is given of the chain of islands which stretches from Zuqar down to Ras Darma near Assab on the Eritrean coast, except for the solitary reference in the *Minhaj*'s table of latitudes to al-ʿAra, a name which appears in early European charts for Great Hanish Island. The navigators obviously never attempted to sail west of al-Zuqar.

The main dangers in the Red Sea were the reefs and shoals of the coastal shelf. I have given above the technical names given to different sorts of island and underwater features and the fact that there were so many different terms and classifications of these features shows how important they appeared in the eyes of those who sailed these seas. In addition to the reefs there were the Ṭiḥāl (sing. Ṭaḥla), areas of discoloured water of which several were well known: Umm Shaiṭān between al-Abʿalah and Kamarān and Ṭiḥāl Marīr (Marrīr?) off al-Zuqāq, important because it stood out on the route north from Saibān and was met with before any of the surface-breaking features. Other discoloured areas appeared between the Ḥajawāt and Saibān and around Āmina near Jizan. Currents, too, were important and tidal races between the reefs were well known, especially on the Farasān bank where, coupled with a contrary wind, they could be disastrous.

Finally it is necessary to compare the accounts of the Arab navigators with the few contemporary accounts which were written by European explorers in the Red Sea. The earliest account of the Red Sea in a European language was written by an unknown Venetian who travelled with the Turkish admiral Sulaiman Pasha when he attacked India and Yemen in 1538–9. The Venetian mentions the primitiveness of the Arab boats, being sewn together and not nailed as were European boats, and comments on the difficulties of navigation in the Red Sea and the terror of running aground on the numerous reefs, stating that there was constant need to have someone observing in order to locate the channels between them. He also mentions the two sorts of pilots; those who sail down the middle and those who go from reef to reef and are called *Rubbān*, but he claims that the middle of the sea was used for southward voyages and the reef to reef method for northward ones. This is what one might expect, realizing

that the prevailing wind was from the north, but not what Ibn Mājid shows us to be the case. Sulaiman Pasha, however, with his Venetian, sailed up the coastal route and not "the path of a true navigator" so that his route is difficult to compare with those of our navigators. However, he does verify one or two coastal places given by Ibn Mājid and Sulaimān. For instance Zeiger, which is probably Sharja. Other places where the two agree are Mecca (Mocha), Camaron (Kamarān), Adjudi (Jizān?), Jasuf (Jufūf?), Jusuman (Kishrān), Mucara (Markhaṭ), Vadum Bahir (al-Bakkār?) and Ziden (Jidda). It is interesting to see that he mentions Chofodan, i.e. Qunfidha, which, although it appears in Bakrī (A.D. 1066) and Yāqūt (A.D. 1228) and on modern maps, is not mentioned by the navigational texts. On the other hand al-Lith, which also occurs in Bakrī, Yāqūt and modern maps, is called by the Venetian, Ariada, the equivalent of Ibn Mājid's and Sulaimān's al-Riyāḍa.

One other European to sail and write an account of the Red Sea was the Portuguese João de Castro who sailed up the African coast in 1541. Unfortunately this means that we have no other contemporary account of the Arabian coast which is full enough to compare with the account of Sulaiman Pasha's Venetian, but it does mean that we do have a complete European account of both coasts at this date (*c.* 1540). João de Castro starts from Bāb al-Mandab, sails to Kamarān and then crosses to Massawa (which he calls Mazua), he then mentions several places which seem to have been important in this area which are not given by our navigators, such as Arqīqo; Dahlak appears as Dallaqua. Then, nearer Suakin, his names coincide with the texts in Marata (Mārāt), Xabaque (al-Shabk), Suaque (Suakin), Dradate (M. Maḍraṭāt), Salaque (M. Salaq) and Ras el Doar (Ras Dawā'ir); the latter, mentioned also by Ibn Baṭṭūṭa, is the most northerly point on the Sudanese coast marked by our navigators.

The other Europeans who visited this area left no accounts of the sea itself and mention Mocha, Jidda or some similar large port, giving no coastal or hydrographical detail. However, from the two more detailed accounts mentioned above it is possible to confirm some of the points mentioned by the Arab navigators, both as to the method of sailing the sea and details of place-names. In addition, the large amount of topographical nomenclature which can be verified from more modern European accounts and the appearance of the chart prepared from the Arab measurements, show what important sources these writers are for our knowledge of the history of sailing in the Red Sea and that they may even show gaps in present-day hydrographical knowledge of the Sea.

BIBLIOGRAPHICAL NOTE

The texts of Ibn Mājid and Sulaimān from the Bibliothèque Nationale were published in phototype by Gabriel Ferrand in 1921–8. (*Instructions nautiques et routiers arabes et portugais.* 3 v. Paris, Geuthner.) Volume 3 of this edition contains miscellaneous notes on the navigators, their art and their written works but this is a mere sketch, many terms are left unexplained and place-names are not identified. Other texts by Ibn Mājid were unearthed in Leningrad and published by T. A. Shumovsky in 1957 (*Tri neizvestnie lotzii Aḥmada ibn Mādjida.* Moskva, Akademia Nauk SSSR) but there is really no original work in this edition. Sidi Çelebi's work *al-Muḥīṭ* contains what is virtually a translation of Sulaimān's *'Umda* into Turkish and this was translated into German by Dr. M. Bittner in Vienna in 1897 (*Die topographischen Capitel des indischen Seespiegels Moḥiṭ mit einer Einleitung sowie mit 30 Tafeln von W. Tomaschek*) and extracts have appeared in English in the *Journal of the Asiatic Society of Bengal* (1834–8). The maps given in the Vienna edition are taken mainly from the latitude measurements and are extremely rough and ready, no attempt being made at identification unless this was obvious. The map of the Red Sea was reproduced in A. Kammerer *La Mer Rouge, l'Abyssinie et l'Arabie aux XVIe et XVIIe siècles*, 3 vols, Cairo, 1947–52. (Mémoires de la Société Royale de Géographie, t.XVII.) The text of Sulaimān Pasha's Venetian also appears in this work of Kammerer (1ère partie, p. 72).

DEVELOPMENT OF THE BRAKE BANK

R. L. CLOET

SOUTH OF THE ISLE OF THANET, extending for about 4·5 sea miles from Ramsgate to the latitude of Sandown Castle, north of Deal, lies a sandbank which is commonly referred to as the Brake Bank (see Fig. 1). Strictly speaking, the name applies to the southern part of this feature, which is now a single unit. Historically, the bank of that name lay well to the seaward of its present position and there were three other small shoals sufficiently distinctive to be separately named (see Fig. 2).

Beginning at the coast just east of Ramsgate Harbour we have:

1. The Dike, distinguishable at one fathom, which extends about half a mile south from East Cliff beach;
2. The Querns, a chalky outcrop about half a mile south-east of Ramsgate harbour;
3. Cross Ledge, originally a shoal aligned E.–W., hence possibly its name, which lies about 1 ½ miles south of the harbour;
4. The Brake, the southern portion of the feature with which we are concerned.

Neither the Querns nor the Cross Ledge are sandbanks in the proper sense, since it seems probable that they are chalk outcrops with an occasional sand capping.

The analysis which follows is based on an examination of the shape of the submarine features in question. Knowledge of the shape is derived from hydrographic surveys. Unfortunately these surveys do not necessarily show the limits of that part of a sandbank which is subject to movement, but only the contours of the sea floor surface. Therefore, as the bank moves over an uneven base, it is generally impossible to measure the total volume of sediment which has moved, or whether the volume of sand in the bank has either increased or decreased. As the sand moves across an area, such as the Cross Ledge, no allowance can be made for it, especially since hydrographic surveys tend to cover a particular shoal feature rather than a particular geographical area. The bank successively covers a different part of the hidden subsurface, and though it is possible to give an approximation of this subsurface, there is no means of charting it with sufficient accuracy.

The component features of the Brake will be examined either at the 1- or the 2-fathomline level, whichever best shows their separate identity. It is not implied that either one or other level is to be taken as the depth limit of the sediment of that particular feature. It is merely an expedient which allows one to dissect an otherwise bewildering complexity, and expose the component parts more clearly.

A practical drawback of examining the movement of the bank at a given fathomline is that a purely vertical building-up would also result in a horizontal movement of that line. It could therefore be of some significance to be able to determine how much is due to a change in sand content and how much of the lateral migration is the original bank being transported. Likewise, a rotation of a bank over a sloping subsurface can have results which may easily be misinterpreted.

The movement of the Dike.—The separate identity of the Dike is best seen at the one-fathom level (see Fig. 3). At low tide a shingle spit can be seen extending seawards from East Cliff beach at Ramsgate; at present the spit is about a quarter-mile long at one fathom, a comparatively minor feature. It is steeper to the west than to the east, but on the scale of several surveys this is not clearly brought out. The movement of the Dike has been measured for the mid-point of the root of the spit, where the fathomline becomes parallel to the shore. Since 1795 the Dike has moved about 3000 feet, or half a sea-mile south-westwards, at an average rate of nearly 20 feet per year. From 1947 to 1959, the date of the last survey, the mean rate was rather more than this, and there is as yet no sign of its slowing down. It is inevitably coming closer to the East Breakwater, even though it is moving more slowly than the remainder of the Brake.

The southward extension.—A remarkable history of apparent growth reveals itself at the one-fathom level (see Fig. 3). In 1795, one sees only the Dike and the Cross Ledge as two separate patches reaching up to one fathom. By 1865 a long line of shoals has extended itself nearly to the present length of the bank. After this the movement of the southern limit, at one fathom, extends much more slowly, but a further indication of the southward movement can now be seen to take place on the lower of the shoals, the Brake proper. The southernmost of the shoals shows a distinct tendency to develop a triangular outline, whose apex is to the south, and whose base is to the north and runs almost E.–W. Looking back to the 1865 survey, the expansion of this shoal can be seen in embryonic form, where one patch is distinctly wider than the others. The latitude of this northern base has been decreasing steadily since then, but in 1959 the shape has become less distinct.

The westward drift and the northward component.—From the navigational viewpoint, one of the most troublesome parts of the bank is that portion which continually encroaches westwards on the Ramsgate Channel, in the latitude of the Cross Ledge. Consequently the track of the point which lies furthest west, along the western limit of the Bank, i.e. the western maximum, has been examined. The bank is at its steepest here, and in order to have an unbroken fathomline, during the period under review, the westward travel of that point on the 2-fathom line has been followed. Figure 4 shows the track of the western maximum. When resolved into its westward and northward components, one finds that the westward rate is linear, and about 45 feet per year, but the northward component is quadratic, and is at present about 55 feet per year.

It could be said that the latitude at which the bank moves most rapidly westwards is increasingly northward of its former position, but it seems more likely that the sand is moving increasingly from westward to north-westward.

Along the same western side of the bank, a secondary maximum can be seen, a little doubtfully at first in 1926, but more clearly on the subsequent surveys. This "bulge" appears to move along a track similar to that of the first maximum, with an accelerated northward component. It will soon be indistinguishable from the westward maximum in the main curve of the fathomline. The way the secondary maximum catches up on the first suggests that a certain quantity of sediment has become less firmly attached to the main body of the bank, and having disturbed the smooth curvature of the bank, is now subject to a greater rate of transport than the main body.

A similar case occurs along the Fork, the southward pointing arm of the Goodwin Sands, which lies just east of the Brake Bank. During the period 1922–47 a kind of recurved submarine spit developed along the west side of the Fork, and could clearly be seen to travel rapidly southward, while the whole feature became increasingly better defined, at greater depths, until it finally disappeared about 1947, having travelled about 3 sea miles in twenty-five years. Although the recurve did not lose its identity in the process, it became progressively smaller, and the Fork ended up by lying further to the westward.

The expansion of the Brake Bank.—Having looked at the evident change in shape of the Brake, the change in area of the bank was next examined. At both the 1- and 2-fathom levels the change was one of rapid growth, and rather greater at the 1- than the 2-fathom depth (see Fig. 5). At 1 fathom, the increase in acreage accelerated all the time. It moderated slightly on the 1926 survey, and was even almost reversed in 1947, but the general picture leaves no doubt about the trend.

From about 145 acres in 1795, the area grew to 215 acres in 1865, which is an increase of 1 acre per year. By 1926 there were over 430 acres, a mean rate of increase of almost 2 acres per year. Last year, 1959, the surface area measured nearly 820 acres, i.e. 390 acres added in thirty-three years, or nearly 12 acres per year. In 1947 the acreage was 492, and the increase between 1947 and 1959 worked out to 25 acres per year over the last twelve years, but when least squaring the acreage from 1795 to 1959, a quadratic curve is obtained, which indicates a mean rate of growth of about 9 acres per year at present.

In making the above comparisons in area at 1 fathom, the area of the Dike was

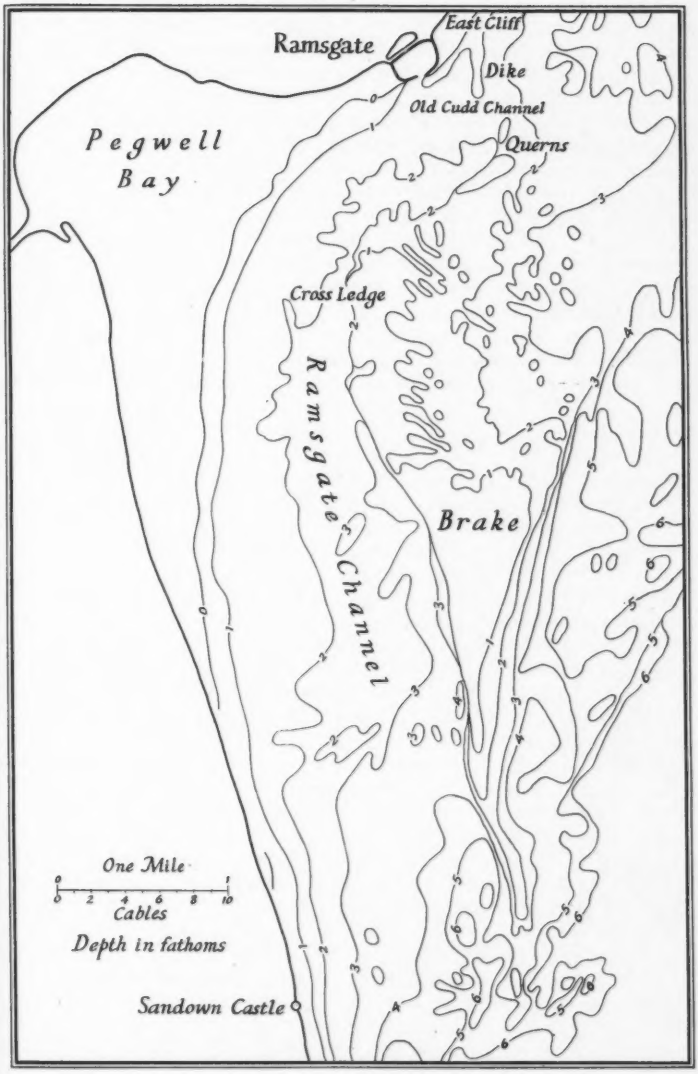
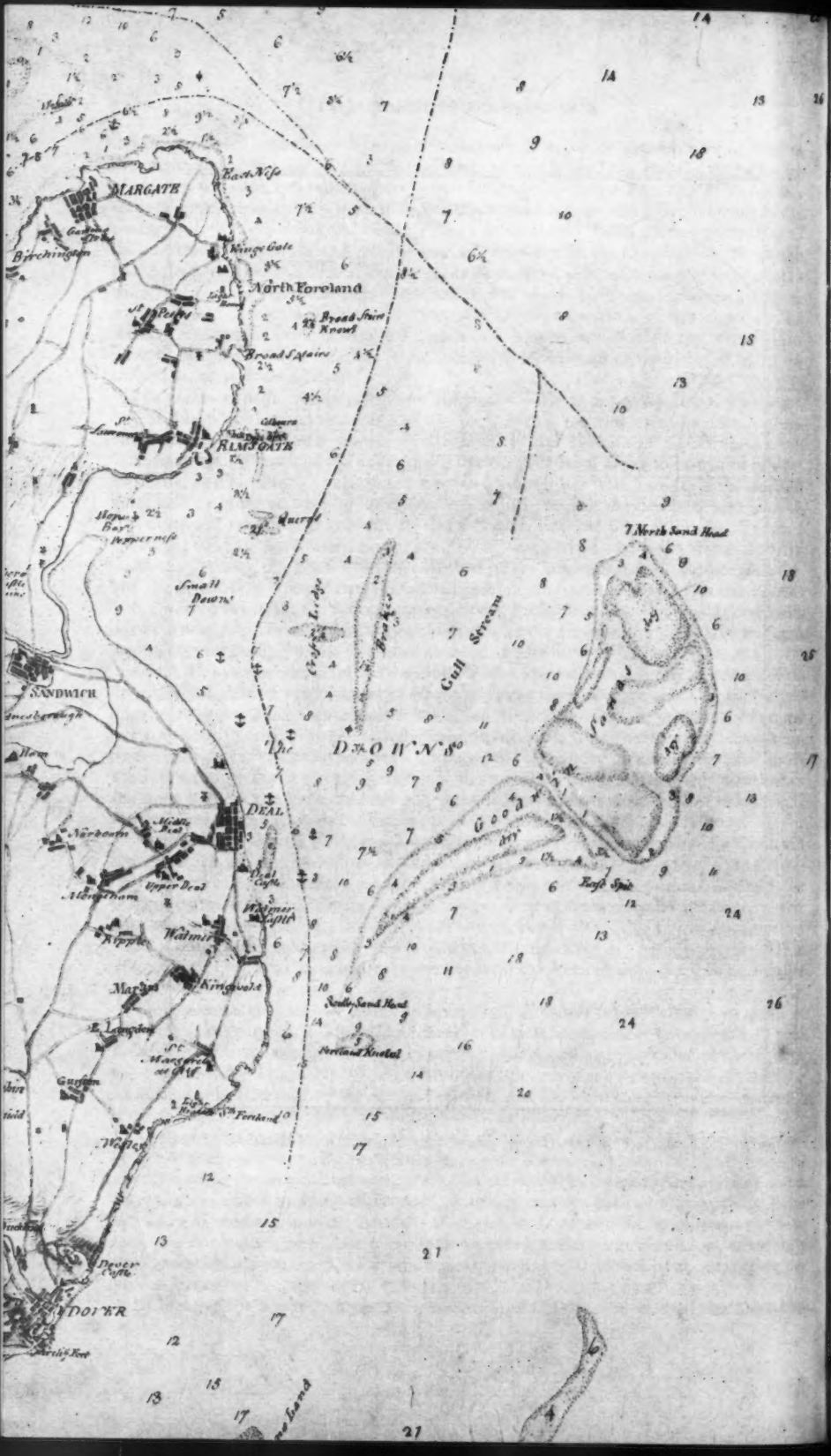


Fig. 1. Location of the Brake Bank (see Admiralty Chart no. 1828)


MARGATE
North Foreland
RAMSGATE
SANDWICH
DEAL
DOWNS
Cull Stream
North Sand Head
Goodwin
DOVER

included. This small bank had a surface area of about 60 acres in 1795, which decreased to only 23 in 1896, but became 45 again in 1936, only to drop back to 30 in 1959. The Dike's contribution to the area of the Bank is therefore a modest one now, but some interest lies in the change in area which appear to occur on it. There may be a periodic casting off southward of smaller shoals, which then become part of the main body of the Brake. Such movement would constitute a small but definite contribution to the size of the Bank, and derives from a source outside the sediment field under consideration. At the 2-fathom level, the area of the bank has to be measured in the same way, from the point where the fathomline bends sharply to become parallel to the coastline. This is also the narrowest point of the bank at this level. The shoals which at 1 fathom lie north of this point are excluded but, as was shown, the Dike has only a minor and diminishing effect on the acreage.

In 1795, the acreage was about 485 and became 570 acres in 1865, an increase of rather over an acre per year, much the same as at 1 fathom. By 1926 this had become 630 acres, and in 1959, 865 acres was reached, as compared with 820 at 1 fathom. The average rate of increase, obtained by least squares, is about 6 acres per year for the next decade. In spite of the apparent discrepancy in rate of increase at 1 and 2 fathoms, it was found that the relationship between the rate of growth at the two levels was approximately linear.

The rotation of the Brake.—The rotation of the Brake between 1795 and 1865 was quite rapid, about 7 degrees. It was reversed to the extent of 3 degrees between 1865 and 1926, which year was also a low point in the rate of growth of acreage. The 1936 value put the alignment back to the 1865 one, and it has since hardly changed. Perhaps this need not surprise us because there is now not much room for a rotation of several degrees. The westward drift has continued unabated and so has that of the western maximum. The hinge itself, the Dike, is sliding along the coast.

A comparison of the rotation of the Brake Bank with that of the Goodwin Sands shows an analogy between the relative rates of rotation before and after 1865. However, the two rates, which were comparable until about the turn of the century, are no longer so now. Both banks appear at present to have slowed down, but the Brake has practically stopped rotating during the last twenty-five years. If there is a relationship between both movements, insofar as the Goodwins may be the cause of the coastward movement of the Brake, it may follow that the slowing down of the latter, due to its running aground, has produced a reaction, and that the Brake in its turn is the cause of the slowing down of the Goodwins. One may perhaps recall that on the Goodwins a new channel, the Kellett Gut, appeared about this time (Cloet, 1954*a*).

The movement of the bank, as it has been described so far, has been based on the assumption that it behaves as an almost homogeneous mass. There is an internal circulation on the bank. For instance, the north edge of the lower shoal, the Brake, does move southwards, while along the western side, the maxima are being displaced further towards the north. There is also a further indication of movement from sandwaves which occur on the northern part of the bank, about the Cross Ledge. These suggest a direction of travel towards the north-east, at right angles to the western 2-fathom line, and into the alignment of the Old Cudd Channel (Cloet, 1954*b*).

The development of the secondary western maximum resembles that of the Fork, along the west side of the Goodwins, and conveys a strong impression of being the spasmodic movement of a quantity of sediment which begins to glide along the side of the main part of the bank, and attains a velocity in excess of the normal. The bulge produced in this manner becomes gradually reduced in size, until finally nothing identifiable remains. There is no indication that this process results in a loss of sediment to the particular bank.

The sediment circulation.—Movement appears to occur in four directions: 1. Southward on the Dike and along the eastern side; 2. Westward, as a bodily displacement of the entire bank, especially at the western maxima; 3. Northward along the western edge; 4. Rotation in a clockwise direction of the southern relative to the northern extremity.

ig 2. Survey of the area, probably by Murdoch Mackenzie Jr., c. 1775

By permission of the Trustees of the British Museum (K. Mar. III. 45)

Consider what happens on the bank at the state of low tide. The tidal stream flows southwards from the North Sea. The eastern side of the bank is fully exposed to it, whereas to affect the western side to the same degree, the stream needs to cross the bank and thereby lose some velocity, depositing some of the sediment it may carry. The ebb stream reaches the Brake having crossed the chalk ledge east of the Isle of Thanet, which is poor in loose sediment. The stream has thus to develop a sufficient velocity before sediment can locally be brought into suspension, and it will do so more successfully along the eastern than along the western side of the bank. When the stream is reversed, the depth of water increases as the velocity increases towards high tide, which is over 20 feet above low tide level.

The flood stream has access to both the west and the east sides of the bank. Along the west side, the stream has less southward-moving sediment to neutralize than along the east. The net transport along the west side is therefore northwards. When approaching the Isle of Thanet from the south, the water inside, i.e. westward of the bank, can only escape eastwards, where a corridor appears to have been swept clear, at least at the level of 1 fathom. This, the Old Cudd Channel, is the eastern approach to Ramsgate. Its fate is probably intimately linked to that of the Ramsgate Channel, which is itself being squeezed out by the westward movement of the Brake. This suggestion, as far as it goes, accounts reasonably for the first three directions of movement. Together they effectively reflect a nearly self-contained closed circulation. However, there is an anomaly in the southward movement which is not explained.

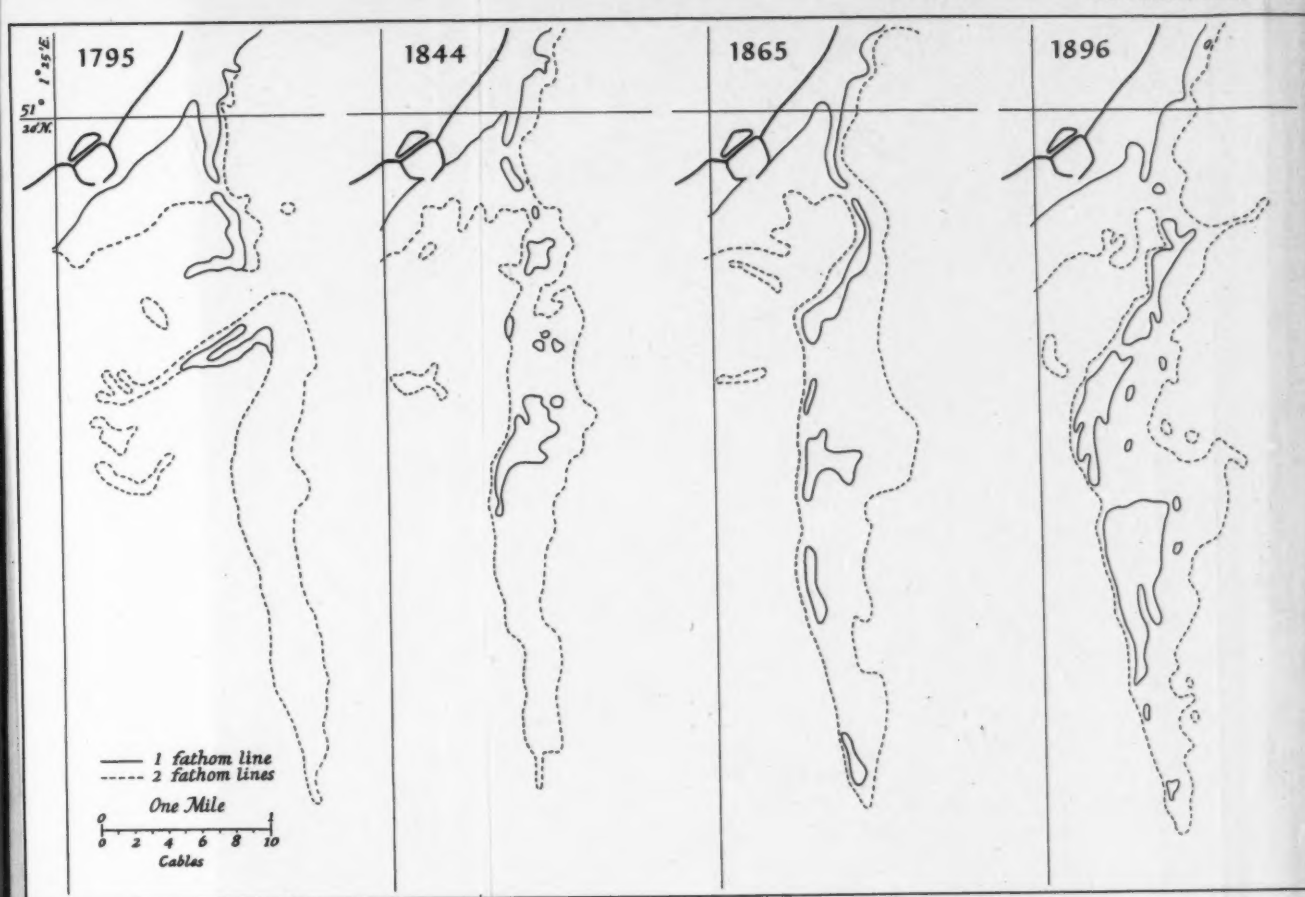
Why should the southern limit of the 1-fathom line have extended so rapidly until 1865, and then slowed down? Then we have also the question of the astonishing increase in surface area, both at the 1- and the 2-fathom depths. As was suggested in the introduction, the contours are a means of identifying a feature and do not necessarily depict the shape of the mobile part of the sandbank. A simplified description of the Brake could be that it resembles a triangular prism lying on its side, resting on a slope which represents the profile of the subsurface outwards from the shoreline (see Fig. 6*a*). If that prism has its long axis at an angle to the contours of the slope, the contours will intersect it in such a way that the plane sections are elongated triangles. A slight swing of the prism towards becoming parallel with the contours, or "beach line", results in a rapid elongation of the plane section at any given level, such as took place on the Brake until 1865 (see Fig. 6*b*). If the prism is made to migrate up the slope, the area of a particular plane section will also increase, and should the prism also become steeper, without a change in volume, the rate of increase will be more rapid at the higher contour level than at the lower (see Fig. 6*c*). It is suggested that this analogy is valid in the case of the Brake Bank, but because the coastline is not straight the bank is curving into Pegwell Bay.

Although there is an internal circulation of sediment in the bank and perhaps some addition of sediment, one need not therefore postulate any change in volume of sediment to account for its over-all movement. The same general changes as have been observed could have occurred had the Brake been like a triangular prism of some plastic material, lying on a solid slope, and was being acted upon by a gradually changing pressure field around it in the liquid in which it was immersed.

There does not appear to be such a plastic material in production, but the suggestion that the behaviour of a bank may be one of deformation rather than one of a continuous interchange of sediment with its environment is of fundamental significance. Robinson, recently examining the Skerries Bank off Start Point, discovered a similar homogeneity of that bank, and no evidence whatever that sediment either was brought to or carried away from it (Robinson, 1961).

Too little is known at present about the possible size of circulation units in banks or about how much interchange there may be from time to time between adjoining units. Better knowledge of this might result in the ability to estimate the likely movement of banks from their shape.

Possible future development.—There is no doubt that given the continuation of the present conditions, the Brake must before long merge completely with the shore. As



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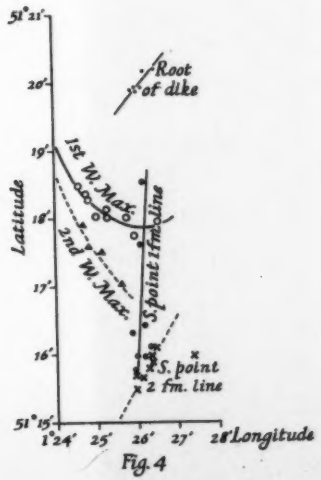

Fig. 4

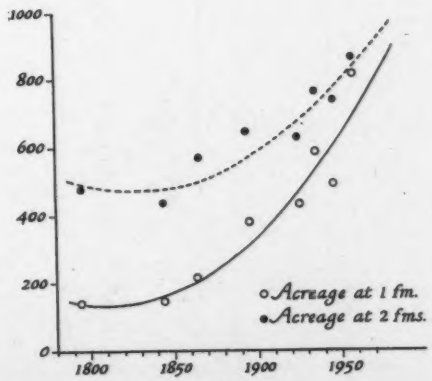

Fig. 5

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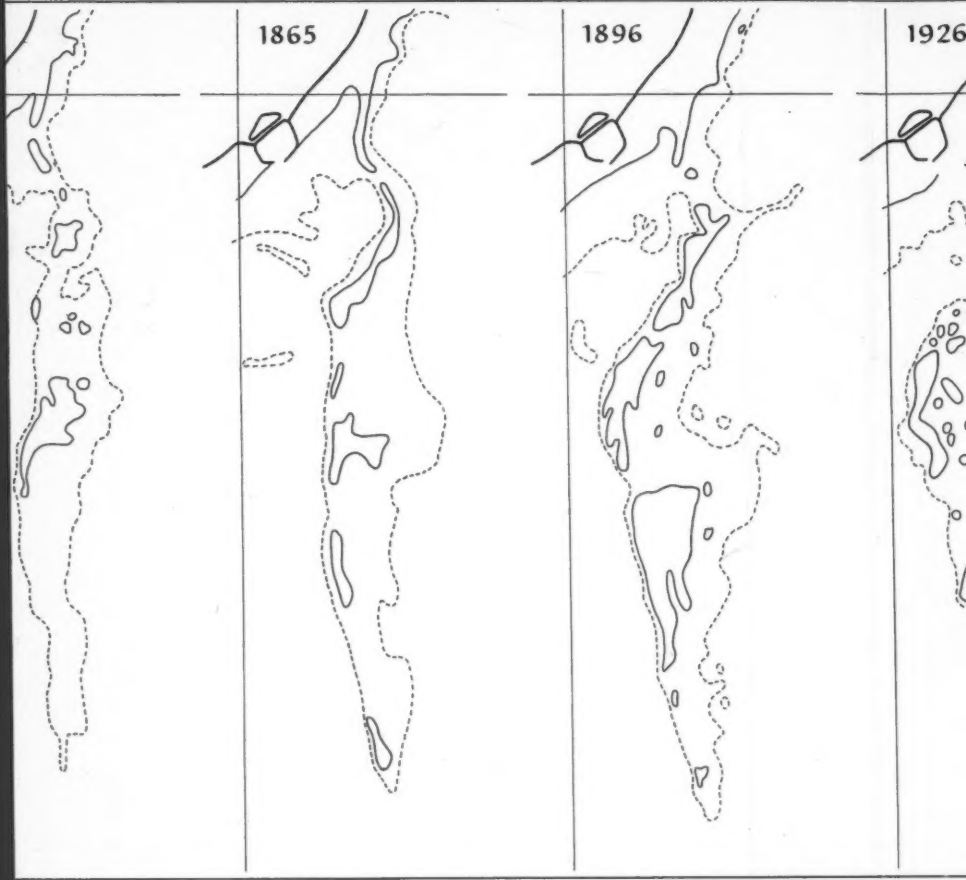

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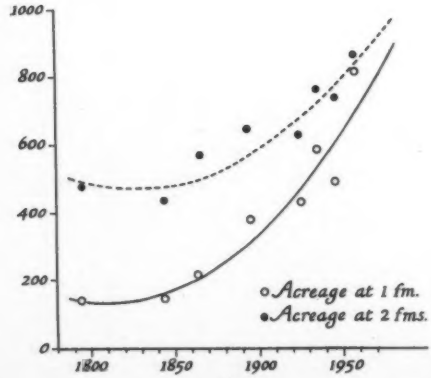

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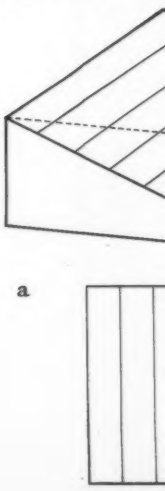

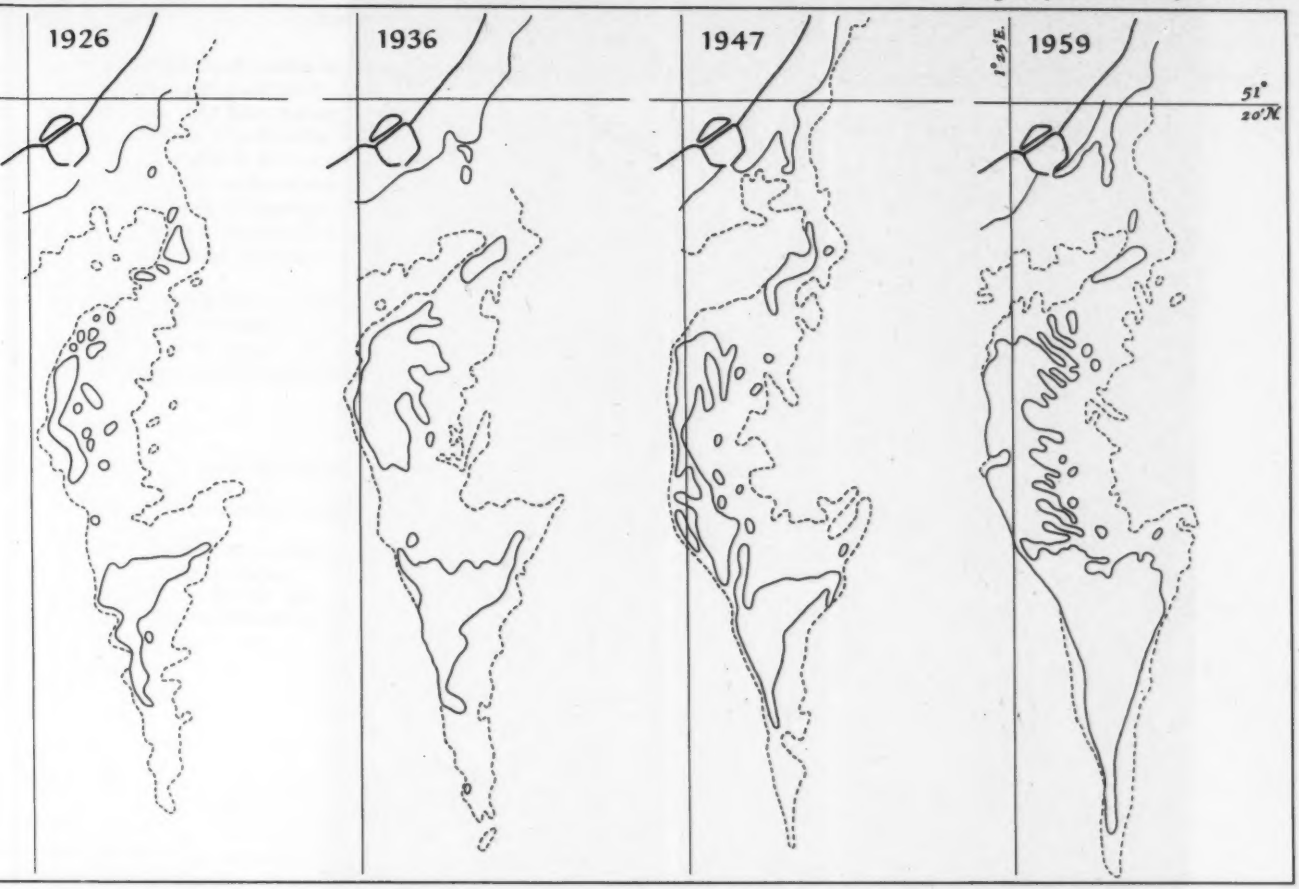

ent of the Brake Bank

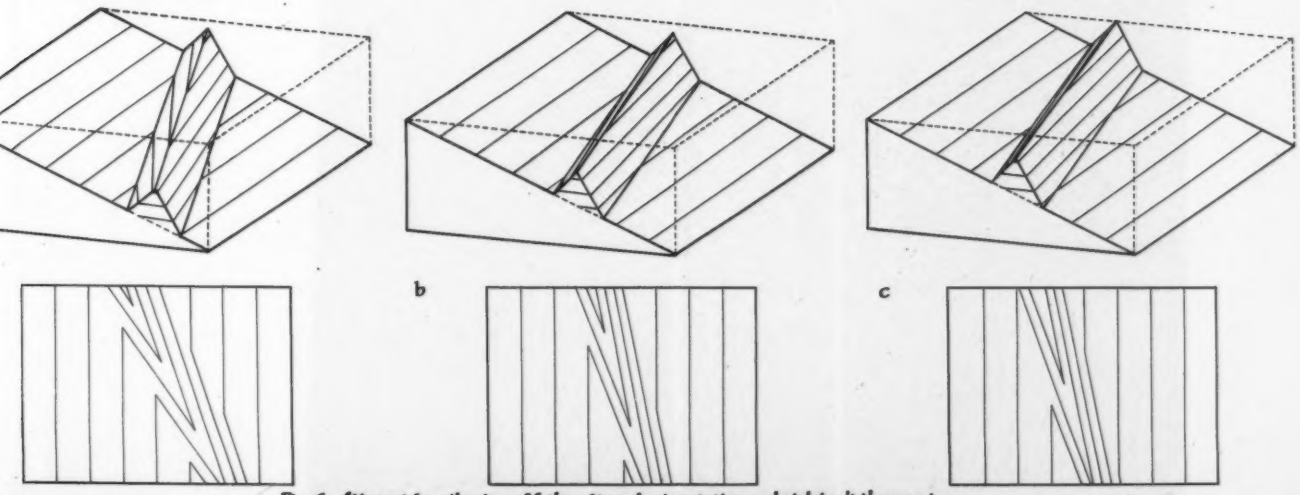

Fig. 6 Apparent lengthening of fathom lines due to rotation and upslope displacement

long as the flood stream achieves the necessary velocity, it will keep the Ramsgate Channel swept reasonably clear, even though it cannot prevent the channel becoming narrower. The floor is being kept at base level, but that base slopes upwards towards the coastline. The flood stream also "flushes" the Old Cudd Channel, but it seems unlikely to be able to do so any longer once the southern approach seals it off. What may happen finally is that a narrow ridge will connect the Querns to the Dike, and to the coast just east of Ramsgate, producing an appearance similar to Stonar, the shingle bank between Sandwich and Ramsgate, as the longshore northward drift becomes dominant along the new coastline (Robinson and Cloet, 1953).

Acknowledgement.—The figures have been compiled from documents in the Hydrographic Department of the Admiralty, in particular from Admiralty Hydrographic Surveys from 1795 to 1959. Although the author is employed in the Hydrographic Department, the responsibility for his statements rests with him.

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KNOB LAKE: A FIELD RESEARCH CENTRE

EDWARD DERBYSHIRE

THE IRON-MINING TOWN OF KNOB LAKE (Schefferville on Canadian maps) was established in 1954 in the heart of the vast peninsula of Quebec-Labrador, towards the southern end of a narrow belt of late pre-Cambrian sedimentary rocks known as the Labrador Trough. In the same year, the Geography Department of McGill University set up the McGill Subarctic Research Laboratory. This was designed to bring five young field scientists each year into contact with a formerly untouched part of the Canadian subarctic, as well as to provide facilities for more established field workers to conduct research during the summer period. This was achieved by undertaking to provide a first-order weather station at the Laboratory in return for aid with running costs and salaries for the research assistants-cum-weather observers. Assistants wishing to incorporate their research as part of a further degree at McGill undergo certain tutorial courses under the resident Field Director. The long winter renders active fieldwork impossible, but does provide the opportunity for wide reading and preparation for the approaching field season.

The period of establishment (1954–7) saw the initiation of several important lines of research. The question considered to be of overwhelming importance is that of the deglaciation of the plateau at the end of the Pleistocene period. Allied to this is the study of palaeoclimatology, particular interest attaching to changes in climate since the great ice sheets began to wane. Within this programme there is space for the geologist, the geomorphologist, the biologist and the climatologist. In terms of human developments at Knob Lake, there is much to attract the economist, the social psychologist and the sociologist.

The work which has been accomplished may now be reviewed, and a summary given of the principal lines of research which demand development.

Geology.—Field research into the bedrock geology of the Labrador peninsula has been intermittent and scattered. Apart from the pioneer traverses of A. P. Low in the late nineteenth century, attention has been fixed principally upon the sedimentary rocks of the Labrador Trough. Even today, the geological map of the peninsula is essentially that produced by Low, detailed surveys even of the pre-Cambrian sedimentary rocks at Knob Lake coming only after the Second World War. Preliminary mapping elsewhere in the peninsula is going on but, as a result of commercial interests and the high costs of conducting detailed ground surveys in such terrain, the work is entirely in the hands of the major exploration companies and the Geological Survey of Canada.

Opportunities for hardrock research are accordingly limited for the staff of the McGill Laboratory, although certain problems of great geological attraction present themselves within relatively short distances of the Laboratory. For example, the existence of xenoliths within the granite-gneiss province of the Canadian Shield, inferred from the profuse glacial erratics and from examination of aerial photographs, attests to granitization activity, no examples of which have been seriously studied in the field. Work on comparative rates of weathering of the variegated rocks of the region has yet to begin and would be particularly valuable in some possible nunatak areas of the last glaciation in the coastal uplands.

Geomorphology.—With its periglacial climate and very recent deglaciation, it is hardly surprising that interest should be overwhelmingly in the fields of periglacial and glacial geomorphology. However, the development of the drainage pattern of the peninsula is also of great interest and this, together with the profusion of erosion levels reported to exist throughout the peninsula, forms an enormous field of study which has not yet been approached.

The study of the glacial geomorphology, with particular reference to the retreat of the last ice sheet, provides considerable scope. The collection of evidence from the

Knob Lake district began with localized studies in 1955 (Ives, 1956) which were broadened and extended to other parts of the peninsula in subsequent summers. This work early suggested that the deglaciation proceeded from the east coast towards the central plateau region, where abundant evidence of final wastage exists. J. D. Ives contributed evidence from two summers' work in the Torngat Mountains (1957, 1958), followed by investigations in the Indian House Lake and Helluva Lake–Lac Le Fer areas. At the same time, the writer collected late-glacial evidence near Knob Lake in

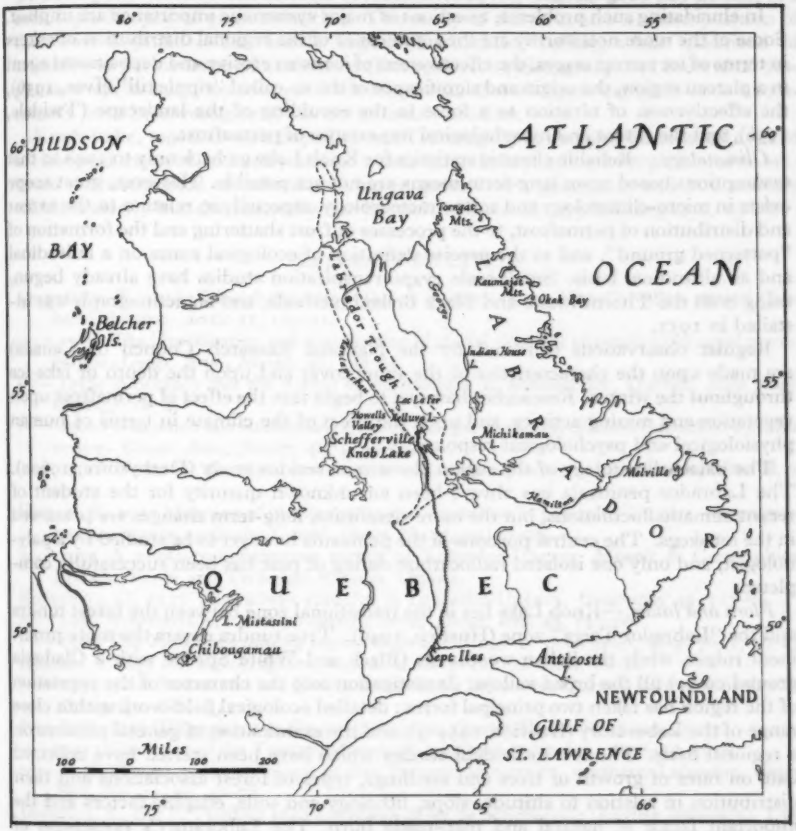

Figure 1

1957 and extended the work westwards to the Howells Valley and northwards to Helluva Lake to join up with Ives in 1958 (Derbyshire, 1958*a*) (Fig. 1). Work is also in progress in the Kaumajet Mountains and Okak Bay region in the north-east.

This constitutes the first part of a long-term programme to investigate the deglaciation of the north-eastern quadrant of the peninsula. It is clearly little more than a beginning for, apart from some work based upon the aerial photographic coverage (Derbyshire, 1958*b*), the remainder of the peninsula is scientifically unexplored. Specialists in many fields other than glacial geomorphology are demanded, including botany, palynology, geology and climatology. A good example of this is the closely allied micro-meteorology, microclimatology, palaeoclimatology and permafrost programme conducted under the direction of Dr. S. Orvig of McGill University.

Numberless problems remain, some of the more obviously outstanding being the question of multiple glaciation of the peninsula, the development of the periglacial land forms (Twidale, 1959), the relationship during the glacial period of the ice-covered plateau to the depression represented by Hudson Bay, the effect of isostatic recovery and eustatic change upon the present coastlines and the distribution of land and sea, the profiles and regimes of the major rivers, and the precise significance of mountain-top detritus, or *felsenmeere*, in relation to problems of unglaciated enclaves in mountainous regions.

In elucidating such problems, questions of major systematic importance are implied. Some of the more noteworthy are the significance of the regional distribution of eskers in terms of ice retreat stages, the effectiveness of ice as an erosive and depositional agent in a plateau region, the origin and significance of the so-called "ripple till" (Ives, 1956), the effectiveness of nivation as a force in the moulding of the landscape (Twidale, 1956), and the extent and morphological importance of permafrost.

Climatology.—Reliable climatic statistics for Knob Lake go back only to 1948 so that assumptions based upon long-term means are not yet possible. However, great scope exists in micro-climatology and micro-meteorology, especially in relation to the extent and distribution of permafrost, to the processes of frost shattering and the formation of "patterned ground", and to the precise definition of ecological zones on a latitudinal and an altitudinal basis. Small scale evapotranspiration studies have already begun, using both the Thornthwaite and Black Bellani methods, and an actinograph was installed in 1957.

Regular observations (directed by the National Research Council of Canada) are made upon the characteristics of the snow cover and upon the depth of lake ice throughout the winter. Researches have yet to begin into the effect of permafrost upon vegetation and mining activity, and upon the effect of the climate in terms of human physiological and psychological response.

The palaeoclimatology of the region also awaits serious study (Derbyshire, 1960*a*). The Labrador peninsula has always been an unknown quantity for the student of recent climatic fluctuations, but the more significant, long-term changes are preserved in the muskegs. The central portions of the peninsula have yet to be studied by a palynologist, and only one isolated radiocarbon dating of peat has been successfully completed.

Flora and fauna.—Knob Lake lies in the transitional zone between the forest tundra and the "Labrador Taiga" zone (Hustich, 1949). True tundra covers the more prominent ridges, while the lichen woodlands (Black and White Spruce with a Cladonia ground cover) fill the broad valleys. Investigation into the character of the vegetation of the region has taken two principal forms: detailed ecological field-work within close range of the Laboratory (Hustich, 1954–5), and the examination of general patterns on a regional basis. The few individual studies which have been started have collected data on rates of growth of trees and seedlings, types of forest associations and their distribution in relation to altitude, slope, lithology and soils, edaphic factors and the important factor of natural and man-made burn. The Laboratory's possession of small-scale aerial photographic coverage (*c.* 1:40,000) of the whole of the Labrador peninsula has made possible the examination of the vegetation from the point of view of vegetational assemblages. The method depends upon the establishment of a series of "cover types" suggested by the photographs and confirmed and modified by selective ground survey. The mapping of the variability of vegetation cover on what is a simple physiological rather than an ecological basis is of no small value to the geographer. The vegetation of the whole of the peninsula has been mapped in this way by the McGill group at a scale of 8 miles to 1 inch (Hare, 1955; 1959), while the environs of Knob Lake were mapped at 1:50,000 scale by the research staff during 1956–7. The extension of this latter survey would provide a vegetation map series of great value.

Studies of the fauna have been rather fewer than those concerned with the flora, and those that have taken place have been concentrated on the bird life which is relatively rich, especially in early summer. Ample opportunity exists for observations of migra-

tion based on a series of full summer cycles, especially in the undisturbed lake-filled depressions near Knob Lake. Other wild life includes bear, fox, lemming and the declining caribou, several small herds of the latter being easy to find less than 50 miles from the Laboratory.

Mining, transportation and sociology.—Studies of the economic geography of extractive industry in a subarctic setting (Journaux and Taillefer, 1957) and the examination of the transportation geography (Humphrys, 1957; Langlois, 1955) await development. The company town of Schefferville (Humphrys, 1958), with its 3000 population, is a sociological entity of great attraction. The study of the structure and composition of the town population has barely begun (Derbyshire, 1960*b*), while questions of attitudes to permanence of settlement (Derbyshire, 1958*c*), group and individual response to climate and isolation, and the long-term effects of growing up in such a community have been recognized but not seriously studied.

Knob Lake, together with Sept Iles and Chibougamau, presents an unusual type of sociological material, the relevance of which extends beyond its own problems to embrace the wider field of subarctic living in general in a generation and in a country which is slowly but determinedly moving north (Twidale, 1958; Humphrys, 1960).

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ONE HUNDRED YEARS AGO

THE FOLLOWING EXTRACT is taken from the account of the presentation of the Royal Medals to "Captain Speke, the discoverer of Lake Nyanza; and Mr. Macdouall Stuart, the explorer of Central Australia." It is printed in the *Journal of the Royal Geographical Society*, Vol. 31, 1861, pp. civ–cv.

"AT a previous anniversary it was made known by the Council that in awarding one of our Gold Medals to Captain Burton for his various adventurous explorations, we also fully recognised the high merits of his coadjutor Captain Speke, not only for his geographical labours in laying down their joint map, but also for his independent discovery of the Lake Nyanza Victoria. Had not the Council then desired to divide its honours between the leaders of discoveries in Africa on the one hand, and in North America on the other, there can be no doubt that Burton and Speke would have been simultaneously honoured.

As it is, however, we now have it in our power to give to Captain Speke precisely the same honour which was conferred last year on Captain Burton. Our satisfaction in doing this is increased by knowing that the man we now honour is at this moment employed by the Royal Geographical Society, assisted by Her Majesty's Government, in one of the most arduous enterprizes which was ever contemplated. For if Captain Speke, with his gallant associate Captain Grant, should succeed in defining the whole of the Lake Nyanza, and should be able so to pass northwards as to join Consul Petherick on that southernmost portion of the White Nile, up to which boats and canoes can transport provisions from the north, then truly he will have laid open a vast portion of the interior of Africa hitherto entirely unknown. Whether, indeed, he may be able to determine (even with the aid of the bold and successful Petherick) what may be truly the remotest source of the White Nile, is very problematical. For the Lake Victoria Nyanza, along the banks of which he will proceed, must doubtless be fed by affluents, some of the most powerful of which may descend from the lofty chain of Kenia and Doengo-Engai on the east, and others from the so-called Mountains of the Moon on the south-west.

In this point of view, many a year may elapse before the geographer will be able to trace to its spring-head the largest of these countless affluents. But looking to the White Nile as a gigantic stream which flows directly from south to north, and is subtended and barred in by flanking chains, it will be a sufficient triumph for this our expedition, if Speke can but prove to us, as he has indeed suggested, that his Lake Nyanza Victoria does so range from south to north as to be in direct communication with, and in the same meridian as the Upper White Nile, into which it is supposed the stream descends by cataracts from the water-parting near the Equator, through the Nyanza Victoria.

If Captain Speke should work out this important feature of the mission we have confided to him, he will assuredly reap a scientific glory from his exploits at the sources of the Nile, and thus be entitled to share the honour of the anagram applied to the illustrious Nelson after his victory at the mouth of that classic stream,—

"Honor est a Nilo!"

THE INDIAN–CHINESE BOUNDARY DISPUTE

REPORT OF THE OFFICIALS OF THE GOVERNMENTS OF INDIA AND THE PEOPLE'S REPUBLIC OF CHINA ON THE BOUNDARY QUESTION.

New Delhi: Ministry of External Affairs, 1961. 9½ × 6 *inches; 342 pages + Chinese report of 213 pages*

IT IS NOT POSSIBLE in a short space to cover an immense document of 555 closely printed pages, packed with comment upon comment, as Pelion piled on Ossa and Ossa on Olympus. What follows is best read as a postscript to my address given to the Society on 2 May 1960 (*Geogr. J.* **126** (1960) 298–309).

Considerably more than half this document is devoted to the Indian case, a feature easily explicable in terms of the much greater volume of evidence offered on the Indian side. Indeed, an objective reading of the reports of both sides makes no other conclusion possible but that the Chinese have no precise or detailed on-the-ground or on-the-map knowledge of any sector on to which they have been unable to effect physical penetration during the last ten years since their occupation of Tibet. Before that, outside Lhasa, they were in the main ignorant of all this part of Tibet. This is completely apparent on the eastern sector south of the McMahon line, where Chinese unacquaintance with topographical, historical and ethnological fact is evident at every point. Even where the Chinese are now in physical occupation beyond the boundary claimed by India, as where they have built a road across the Aksai Chin in the western sector, there too (though in a manner significantly different) the scantiness of geographical detail given by their officials suggests that China has her own reasons for withholding factual information.

But there is a wider and deeper significance which makes the reading of this dual report a fascinating exercise. This is in its revelation of the contrasted intellectual approach to a dispute by the representatives of the two maturest civilizations in the world, each in the bloom of a renaissance. The expositions of both sides bear every mark of a trained ability, a calm confidence. Both are subtle. But the Chinese side relies for effect mainly on proud assertions that make mock of contradiction and disdain logic and even evidence. At times, too, the Chinese argument is shot through with a kind of sly mockery; the new idea cannot refrain from a dig at India for "benefiting from the fruits of British imperialism"—an echo of the Communist Manifesto. The Indian argument on the other hand is based on sifted evidence, and marshalled with a lucid clarity and respect for logic worthy of any Oxford cloister. Save perhaps on the ground of prolixity, a Socrates could hardly fault it. As for us imperialists, it is possible to deduce with satisfaction that in respect of frontiers we discharged a great trust not unworthily.

A powerful instance of Chinese disrespect for logic is to be found in an utter denial of Tibetan competence to negotiate the McMahon line with one breath, contrasted with a reliance with the next on that very competence in the middle sector above the Ganges sources. An example of sustained Indian argument is the demolition of the Chinese case that "there has been no delimitation", and in a suggestion, well put, that Chinese argument alone is embarrassing to the Chinese and suffices to buttress the claims of India. A host of other instances could be quoted to sustain this impression.

There remains in my judgement one general consideration of the utmost import which has evaded the intellectual grasp of both combatants. As stated in my address, "the fact is that it is only recently that the Western notion of fixed boundaries up to which an organized State administers on either side has begun to correspond with realities in Asia". The boundaries previously were nebulous; it was as if the sun of the imperial power, whether shining from Peking or from Delhi, cast a shadow only in the frontier regions. In Manchu times such a vague shadow fell over Tibet, until in 1911 the Manchus fell, the clouds hid the sun, and the shadow disappeared. In British, Mughal and earlier Hindu times the shadow cast by the Indian sun fell as far as the

crest of great mountain arcs of the Himalaya and the Kuenlun, and this was a shadow never obscured. It is only as time advanced that it gradually became necessary to define with precision the edges of the shadows cast.

To a Chinese objection that in respect of old and traditional claims India relies overmuch on myth and epic there is a neat reply. The evidence in Homer's *Iliad* of Greek conquest of the Ionian coasts of Asia is found to be confirmed when history opens, and is referred to in the early pages of Herodotus, the father of history.

May I end with a suggestion for greater precision on one vital point? The Indian side makes much of the watershed principle on the Himalaya, though the writers are constrained to admit that, like others, this watershed is cut by many rivers. But, admitting that the Himalayan crest is, as it is, a subsidiary watershed, it is not always the highest range which is the water-parting or which adjoins the Tibetan plateau (thus Everest does adjoin the plateau; Kangchenjunga and the highest peaks near the Ganges sources do not; there is another lower range to the north). Subject to a few exceptions, e.g. the Chumbi Valley and Kyerong on the Nepal frontier, the true boundary of the Indian world is on the crest of the northernmost—not always the highest—crinkle of the Himalaya where it overlooks and falls to the Tibetan plateau. As those who have seen it know, the transition from Himalaya to plateau is too obvious on the ground to be mistaken.

In these two reports there is no common ground. This is not surprising, given that China is seeking to assert a claim, never made before, to the Indian Olympus.

OLAF CAROE

STUDIES IN THE HISTORY OF EXPLORATION

IN THE LAST YEAR OR SO a fashion has set in for publishing large and lavishly illustrated volumes aiming at covering the history of exploration in the widest sense. Associated with these are an increasing number of studies, popular and academic, on particular phases of that history. In time, no doubt, the findings of the more scholarly of the latter will find their way into texts of the former type. The following notes—not detailed examinations of each work—may guide the general reader.

The most attractive of the general works, and also the most stimulating, is that by the Swiss author, Albert Bettex (*The discovery of the world*, 1960). Approaching the subject from a fresh viewpoint, he has produced a delightful book which gives almost another dimension to the history of exploration. As he has realized, the illustrations to the records of travellers often tell us more than a written description, but they also tell us a great deal about the artists and the public for whom they worked. From the remarkably comprehensive and varied reproductions in his book the reader will form a much more realistic and human conception of the explorers and the feats they accomplished than is often possible from written texts. Whatever their period and the conventions they employed, these men practise "an art that is trying to express something real". It is easy to smile at Alexander the Great portrayed as "a figure of late medieval chivalry", or Columbus in sixteenth century armour, but these fantastifications brought home to contemporary readers some understanding of what had happened or was going on, and humanized history for their edification. It is interesting to note how Oriental local colour was first conveyed by the introduction of rather crudely drawn elephants and camels. With the scientific revolution, a very high standard of meticulous drawing gradually spread, shown in the beautiful botanical drawings of Carl von Martins or the "almost photographic" detail of a Schlagintweit. Competing with this, from the nineteenth century on, is the romantic treatment, in which one feels that mountains may be drawn not as they appeared to the artist but as he thought they should appear. Some drawings, however, are remarkable for the sense of topographic form they reveal. With Sir Thomas Mitchell, for example, we are definitely among the geomorphologists. Other travellers on occasion had the sense

to employ local draughtsmen, a habit which resulted in the attractive work of the Japanese artist, Tojoske, which accompanies Siebold's classic work. In so far as they helped to popularize (or discourage) the idea of the Noble Savage, such works made some impact on the world of politics.

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crest of great mountain arcs of the Himalaya and the Kuenlun, and this was a shadow never obscured. It is only as time advanced that it gradually became necessary to define with precision the edges of the shadows cast.

To a Chinese objection that in respect of old and traditional claims India relies overmuch on myth and epic there is a neat reply. The evidence in Homer's *Iliad* of Greek conquest of the Ionian coasts of Asia is found to be confirmed when history opens, and is referred to in the early pages of Herodotus, the father of history.

May I end with a suggestion for greater precision on one vital point? The Indian side makes much of the watershed principle on the Himalaya, though the writers are constrained to admit that, like others, this watershed is cut by many rivers. But, admitting that the Himalayan crest is, as it is, a subsidiary watershed, it is not always the highest range which is the water-parting or which adjoins the Tibetan plateau (thus Everest does adjoin the plateau; Kangchenjunga and the highest peaks near the Ganges sources do not; there is another lower range to the north). Subject to a few exceptions, e.g. the Chumbi Valley and Kyerong on the Nepal frontier, the true boundary of the Indian world is on the crest of the northernmost—not always the highest—crinkle of the Himalaya where it overlooks and falls to the Tibetan plateau. As those who have seen it know, the transition from Himalaya to plateau is too obvious on the ground to be mistaken.

In these two reports there is no common ground. This is not surprising, given that China is seeking to assert a claim, never made before, to the Indian Olympus.

OLAF CAROE

STUDIES IN THE HISTORY OF EXPLORATION

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nautical science achieved by the Portuguese. A straightforward biography of Henry is *Southward the caravels*. This is of interest because E. Bradford is a deep-sea sailor who knows the seas traversed by the caravels, and he writes with authority on ships and navigation. Finally, to complete this epoch, there is one of the principal British contributions to the fifth centenary celebrations of the Navigator's death. In connection with the Prince Henry celebrations last year, an excellent and comprehensive exhibition was arranged at the British Museum. The annotated catalogue of the exhibits, largely prepared by R. A. Skelton, is an important contribution to the history of exploration (*Prince Henry the Navigator and Portuguese maritime enterprise*, 1960). The exhibits, 326 in number and including MSS., printed books, maps, navigational instruments, porcelain and carved ivories, are arranged in five sections: Discovery and conquest, Settlement and commerce, Missionary enterprise, Nautical science and cartography, and Portugal and England. This publication will be of permanent value to students of the period.

Later work by the Portuguese in Africa is dealt with in scholarly fashion by Eric Axelson (*Portuguese in south-east Africa, 1600–1700*, 1960). He makes plain the extent and character of Portuguese penetration of south-east Africa, and the considerable wealth derived from it in the seventeenth century. The main reasons for the decline of their rule was the threefold conflict, with Arabs in the north-west Indian Ocean, the warlike tribes of the east coast, and European powers, principally the English and the Dutch. Major causes of weakness were that the settlements were controlled from Goa, and that the official administrative system was clumsy and slow in working. By the close of the century, the fortresses at Mombasa and Sofala had passed from Portuguese control, and only Moçambique remained.

Dr. Beaglehole has revised his history of the discovery of New Zealand which first appeared twenty-one years ago (*The discovery of New Zealand*, 1961). The work that he has done in the interval has resulted in considerable additions to the chapter on Captain James Cook. The book now presents an authoritative and very readable account of New Zealand explorers from the Polynesian chief, Kape, of the tenth century, to Dumont D'Urville. The North Island was well known to the Polynesians of the twelfth century. He is particularly interesting on the relations between the navigators and the Maori people.

Finally, a work on a twentieth century explorer, Admiral Peary (*Race for the North Pole*, 1961). J. E. Weems, who must have consulted, with the aid of V. Stefansson, more material than any other writer on the Peary-Cook controversy, has written it up in a rather over-dramatized style. His conclusions do not alter the generally received judgement, that Peary, for all intents and purposes, reached the North Pole and Cook did not. However, the controversy has many intriguing embellishments arising out of the unusual characters of the two leading players, and many other rivalries became involved. Mr. Weems might have isolated more clearly from all this the astronomical evidence for Peary's success (on which see this *Journal* 89, 255 and 90, 167).

G. R. CRONE

Axelson, E. 1960 *Portuguese in south-east Africa 1600–1700*. Johannesburg: Witwatersrand Press, 42*s*

Beaglehole, J. C. 1961 *The discovery of New Zealand*. 2nd edition. London: Oxford University Press, 21*s*

Bettex, A. 1960 *The discovery of the world*. London: Thames and Hudson, 105*s*

Bradford, E. 1961 *Southward the caravels*. London: Hutchinson, 25*s*

British Museum 1960 *Prince Henry the Navigator and Portuguese maritime enterprise*

Debenham, F. 1960 *Discovery and exploration: an atlas-history of man's journey into the unknown*. London: Paul Hamlyn, 42*s*

Marjay, F. 1960 Editor: *Dom Henrique the Navigator*. Lisbon: For the Quincentenary Commemorations of the death of the Infante Dom Henrique

Olschki, L. 1960 *Marco Polo's Asia* (trsl. by J. A. Scott). Berkeley and Los Angeles: University of California Press; Cambridge University Press, 80*s*

Vigneras, L. A. 1960 *The Journal of Christopher Columbus*. London: Anthony Blond, 45*s*

Weems, J. E. 1961 *Race for the North Pole*. London: Heinemann, 21*s*

REVIEWS

EUROPE

THE BRITISH ISLES. By G. DURY. *London: Heinemann*, 1961. 8½ × 5½ *inches; 503 pages; maps, plates, text-figures.* 30*s*

It is doubtful if any other area of comparable size has so complex a geography as the British Isles. Great geological, morphological and climatic variety combine with a long and complicated history to make generalization and interpretation exceedingly difficult at any stage beyond the most elementary. Since the 1930's considerable changes have taken place in the human geography of the British Isles and a satisfactory account of their contemporary regional geography has been a regrettable omission in geographical writing. Dr. Dury has attempted to fill this gap, with the needs of sixth-form students and undergraduates particularly in mind.

The book is divided into two parts. The first views the British Isles as a whole and outlines the main features of their physical and historical geography; it is to be welcomed as providing a necessary perspective, though it is the section most open to criticism on grounds of over-simplification. The remaining two-thirds of the book, covering some 300 pages, are devoted to an explanatory description of the individual regions. The whole is a very comprehensive and readable survey which lives up to its promise of being up to date.

While it would be virtually impossible to condense so complex a topic without making errors or generalizations of doubtful validity, the general standard of accuracy seems remarkably high; some errors are obvious slips, some are due to over-simplification, while others, fortunately few, are errors of fact. The book is unusual in being pitched at a higher level than that claimed by the publishers; this is a welcome fault and, although many of the implications of statements may well pass unnoticed by the sixth-former, he will nevertheless appreciate Dr. Dury's knack of conveying highly condensed information in a readable manner. The text is well illustrated by 72 photographs, many of them air obliques, and 161 original maps and diagrams. While such wealth of information is to be welcomed, it is unfortunate that a number of the maps contain far too much information and are not easily read. It would also have been helpful to have been given the date and source of the material on which the statistical maps are based.

Drawing on specialist knowledge of individual topics and regions, a critic would not find it difficult to fault a book of this kind; indeed, it could be argued that the task of writing a comprehensive regional geography is now beyond the capacity of a single individual. Experts, with some ideal polymath in mind, will criticize this omission and that interpretation; but, as the work of one man surveying all regions and all topics, Dr. Dury's book is remarkably successful.

J. T. COPPOCK

A MATTER OF TIME: an archaeological survey of the river gravels of England prepared by the Royal Commission on Historical Monuments. *London: H.M.S.O.*, 1960. 10½ × 8½ *inches; 64 pages; maps, plates.* 10*s* 6*d*

The title of this excellent survey conveys the sense of urgency which prompted its compilation, for it is designed to draw attention to the destruction of ancient sites by gravel digging. In his preface the Marquess of Salisbury, chairman of the Commission, sums up the problem: "It has become clear to archaeologists that many of the gravel terraces beside the larger rivers of England were almost as thickly settled in prehistoric and Roman times as were the chalk downs", their densities being revealed chiefly by crop-marks on aerial photographs. "But the total destruction of such remains has now been hastened by the great increase in gravel digging"; mechanical excavators can erase the sites "in a matter of minutes". This publication is a summary guide to the various traces known to occur on river gravels; with its help, field-

workers can survey and examine them with their extreme vulnerability in mind. The severest threat is in the Oxford region: where the crop-marks are most numerous or show most clearly, there the gravel is most easily obtained or of the most suitable quality.

The crop-marks described are *enclosures*, e.g. the small rectilinear "fields" in the Upper Thames valley, tentatively related to Belgic settlement in the late first century B.C.; *circles*, generally about 100 ft. in diameter, occurring in groups and associated with Bronze Age burials (the drought of 1959 revealed many fresh crop-marks, especially in eastern England, too late for inclusion in the text); *cursuses*, straight parallel pairs of ditches about 200 ft. apart, sometimes running for a quarter of a mile and more; *pit-alignments*, *lines of boundary-ditches* and *earth ridges*. Each section has a summary of excavations, and there is a separate essay on the interpretation of complex sites on the Welland gravels between Stamford and Market Deeping, and on the Trent at Newark. There is an invaluable bibliography, thirty-two annotated air photographs, a list of settlement sites in the Ouse, Trent and Welland valleys, and an index. The Commission gives incredibly good value for half-a-guinea, and the two members mainly responsible for writing the survey, H. C. Bowen and R. M. Butler, must be thanked for their clear presentation.

In its recommendations the report mentions a need for more work in "background studies upon the river gravels"; their geology is far better known than their ecology or palaeobotany. There is much to be said for thinking about "terraces" not simply as land forms but as a distinctive habitat. F. V. EMERY

ROYAL COMMISSION ON LOCAL GOVERNMENT IN GREATER LONDON, 1957–60, REPORT (Cmnd. 1164). *London: H.M.S.O.*, 1960. 9½ × 6 *inches; text*, 373 *pages; maps in separate folder*. 28*s*

A Royal Commission was appointed in 1957 "to examine the present system and working of local government in the Greater London area; to recommend whether any, and if so what, changes in the local government structure and the distribution of local authority functions in the area, or in any part of it, would better secure effective and convenient local government." The commissioners held 114 meetings, at 70 of which they heard oral evidence and themselves asked nearly 16,000 questions. The general conclusion of the commissioners, in their unanimous report, is that the London County Council should be replaced by a new Council for Greater London covering a much enlarged area, and that the primary subdivisions of local government in this area should be 52 Greater London boroughs. The latter should be given the status and constitution of municipal boroughs; they would be in the population range of 100,000–250,000. By this means the existing local authorities would be reduced from 95 to 52, mainly by a process of amalgamation. Many of the proposed unions would cause much local heart-burning.

The Royal Commission believes that it is practicable to regard Greater London as one urban entity, whose boundaries are determined by the Green Belt. This Greater London lies within a circle with a radius of about 15 miles and contains 8½ million people. The Commission suggests that the new Council for Greater London should have 115 members, one for each Parliamentary constituency. The proposal means that the London County Council and Middlesex County Council would cease to exist and that the areas of other home County Councils would be reduced. The Commission recommends that the old idea of an upper and a lower tier of authorities should be abandoned. The new conception is that the Council for Greater London would perform functions which can only be or can be better performed over a very wide area, while the Greater London boroughs would perform all the functions which can be performed within a limited area. The proposed division of powers between the Council for Greater London and the 52 boroughs is difficult to describe briefly. The Commission regards it as essential that there should be one development plan for Greater London as a whole and recommend that the Council for Greater London should be the local planning authority for the area. In para. 765 the Commission

states that "the whole area is so interdependent that it is an anachronism to believe that the Administrative County of London can be effectively dealt with as a separate unit. What happens to the population, whether resident or working in central London, has its effects on every other part of the area." Similarly, the main highways and traffic management, in their major aspects, are to be regarded as the responsibility of the Council for Greater London, but housing, welfare and health services would be provided by the boroughs. Many functions would be divided; the boroughs are given an important part in town planning while the Council for Greater London would possess certain powers with regard to overspill housing. Education would be planned and financed by the Council for Greater London, but it would be largely administered by the boroughs.

This is a most readable report and will interest all geographers who are concerned with regional questions. Moreover, it is illustrated by a dozen admirable maps of such subjects as the growth of London, the built-up area in 1958, population density in 1951, and travel to work into central London. If an effective regional planning authority for Greater London is established, as a result of this report, similar authorities for the five other great English conurbations are almost inevitable. Many geographers may feel that the large area proposed for the Council of Greater London is still too small for the effective planning of London. Perhaps some sort of joint planning board for the whole of south-east England is a necessity if London's problems are to be solved.

E. W. GILBERT

THE WESTWARD EXPANSION OF WESSEX. By W. G. HOSKINS. University of Leicester, Department of English Local History, Occasional Papers, No. 13. *Leicester University Press*, 1960. 9½ × 7 *inches; 44 pages; maps.* 10*s* 6*d*

In this stimulating essay Dr. Hoskins traces an expansion phase of Anglo-Saxon settlement in the West Country, from the seventh to the tenth centuries A.D. Military tactics and a succession of frontiers are interpreted in terms of natural features, together with the patterns of land settlement resulting from each surge of the West Saxon wave. Their presence in mid-Somerset as early as A.D. 600 is linked, Dr. Hoskins suggests, with an economic interest in the marshes, to which they took their livestock in summer. They were also established in coastal Dorset, where they launched an onslaught against Dumnonia in A.D. 614. A victory at *Beandun* (identified as Bindon, in East Devon) took them to the Otter, colonizing by means of many "small farmsteads enclosed directly from the woods". They triumphed at *Peonnan* (now placed at Pinhoe, near Exeter) in A.D. 658, and at *Posentesbyrig* (Posbury, near Crediton) in A.D. 661, reaching towards the middle Taw. These and later "campaigns took place where the geography and the incentives called for them". As Dr. Hoskins admits, the fragmentary evidence still leaves room for argument; for example, why did the defeated British after *Peonnan* go north-eastwards to the Parrett marshes, a Saxon region, instead of rallying to the west, where in fact Posbury was fought three years later?

Dr. Hoskins insists that fertile red lands in east Devon "were the great prize of the Conquest". As shown on his map they coincide with the outcrop of both Permian Sandstones and Keuper Marl; this over-simplifies matters, for there are local differences between loams and heavier soils, while Vancouver (1808) distinguished two quite separate regions there. Again, some of the "purely English names" in Cornwall need not suggest a high or immediate degree of anglicization: Callington, Lawhitton and Pawton were "but little touched by English influence" even in A.D. 835 (C. L. Wrenn, "Saxons and Celts in South-west Britain", *Trans. Hon. Soc. of Cymmrodorion* 73 (1959) 73).

The final twenty-two pages of this publication include a "Supplement to the early charters of Devon and Cornwall", by Professor H. P. R. Finberg, and "The 'Landochou' Charter", by W. M. M. Picken.

F. V. EMERY

ST. AUSTELL: church, town, parish. By A. L. ROWSE. *St. Austell: H. E. Warne*, 1960. 11 × 8½ *inches; 88 pages; map, plates, woodcuts.* 25*s*

This book has been published to celebrate the seven hundredth anniversary of the

dedication of the parish church of St. Austell in Cornwall. The author, well known as the historian of Elizabethan England, was born at St. Austell and he writes with affection of his native place and county. The book was printed at St. Austell by H. E. Warne Ltd., a firm established in the town for four generations of the same family. Separate chapters are devoted to church, town and parish. In the first, the architectural details of the church are carefully analysed and Dr. Rowse also outlines the lives of St. Austell men who are commemorated on its walls. One of the most notable was Bishop J. W. Colenso, born at Pondu in 1814, who opposed the oppressive measures taken by the Boers against the Zulus. Similarly, in his account of the town, the author writes with an intimate knowledge of the history of every house and its former inhabitants. St. Austell is now a small town of about 22,000 persons; its history is closely connected with the rise and decline of the mining industry in Cornwall. Dr. Rowse traces the development of the mining of copper and tin, and shows how these industries were replaced by the production of china-clay from about 1880. This gave St. Austell what the author describes as "that astonishing landscape of the cratered moon of the china-clay uplands". St. Austell was ideally situated for exporting minerals by sea from its harbour at Charlestown.

The author acknowledges his debt to the geographer Professor Norman J. Pounds of the University of Indiana, who allowed him to consult an unpublished history of the china-clay industry, and also to two geographers of the School of Geography at Oxford who contributed the large map of the parish. The book is lavishly illustrated with over thirty fine photographs and these are well contrasted with a number of interesting old engravings. The book is an example of the way in which the local history of one parish can contribute to the history of a whole county. Dr. Rowse says that the parish of St. Austell is the heart of Cornwall. By text and photographs the book succeeds not only in portraying the strong geographical individuality of St. Austell, but also in showing it to be representative of the essential Cornwall, "for it has everything of Cornwall in it".

E. W. GILBERT

THE SOILS AND LAND USE OF THE DISTRICT AROUND RHYL AND DENBIGH (Sheets 95 and 107). By D. F. BALL. Memoirs of the Soil Survey of Great Britain, England and Wales, Agricultural Research Council. *London: H.M.S.O.*, 1960. 10×6 *inches;* 115 *pages*

The area involved in this survey comprises an admirable transect, ranging from the sandy coastal zone with its tourist industry through a variety of agricultural belts reaching up to the high bleak moorlands of Mynydd Hiraethog at approximately 1500 feet. About thirty-five soils are described in some detail and a brief comment is made on the agricultural use of each. Special attention is also given to some of the problems, such as drainage, management, trace-element deficiency, encountered in attempting to farm these soils. Of special interest in this Memoir is the place accorded to an historical review of the agriculture of the area and the more detailed treatment of present-day agriculture and land use, including sections on forestry and horticulture. This approach makes the Memoir all the more valuable to the geographer, and this is especially the case when the Memoir covers an area which is by no means heavily documented from a geographical point of view. It is, however, unfortunate that the author regards geography as embracing physical geography only. The first chapter entitled "Geography and geology" discusses physical regions, climate, stratigraphy and structure, and nowhere is there any introduction to, or even mention of, human and economic geography, even though human geographical material is present by implication under such headings as "Land use (historical) and agriculture". Attention should be directed to two admirable features of the monograph: one is the excellent way it has been illustrated. There are some very well chosen plates illustrating the landscapes in which the various soils are found and also the appearance of the profiles of many of the soils described. The other is a somewhat unusual feature in Government publications of this kind, namely, the emphasis on the applied side, e.g. the possibility of an increasing use of some of the soils in the Clwyd Valley for horticultural purposes,

linking this suggestion closely with the nearby markets offered by the tourist resorts and the temporary towns based on the phenomenal growth of caravan and chalet sites along this strip of coast. The Memoir contains a useful bibliography, an appendix of definitions and profile descriptions, followed by seven pages of analytical data. There is also a short index in which the word geography is not even included! E. G. BOWEN

ST. KILDA SUMMER. By KENNETH WILLIAMSON and J. MORTON BOYD. *London: Hutchinson*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 224 pages; maps, drawings and photographs.* 25*s*

The wonders of St. Kilda, a group of four small, isolated islands in the Atlantic a hundred miles west of the Scottish mainland, are denied to all but the privileged few able to travel in private yachts or aeroplanes or charter a fishing smack, apart from the members of the radar station established there by the R.A.F. in 1957. Yet this island has a long history of habitation, probably going back to prehistoric times, and was the cradle of a strange and fascinating culture which lasted continuously for over a thousand years, until it ended in August 1930 with the evacuation of the last member of the St. Kilda community. Fortunately the owner, the late Marquess of Bute, was a keen naturalist and strictly preserved the native wild life, and in his will offered to the National Trust for Scotland the option of taking St. Kilda as a gift. Eventually the Trust accepted ownership and leased the islands to the Nature Conservancy; the preface to this book is written by its Director-General, E. M. Nicholson.

The islands are described in detail, special features being their outstanding cliff architecture, including the highest sheer cliff in the British Isles and also the tallest stacks. The medieval village and Gleann Mor folk will be of interest to antiquarians. The main interest of the book, however, lies in the description of the wild life of these islands. Its rocks and cliffs teem with fulmars, kittiwakes, guillemots and puffins; it possesses the biggest gannetry in the world and is the home of at least three unique animal forms—the St. Kilda wren, a mouse, and the most primitive form of domesticated sheep in the world. The authors also include studies on the behaviour and population size of the local birds, sheep and seals. The book is illustrated with a series of excellent photographs and charts and can be thoroughly recommended as an interesting account of a very remote corner of the British Isles. EDWARD HINDLE

THE MINERAL WEALTH OF WALES AND ITS EXPLOITATION. By TREVOR M. THOMAS. *Edinburgh: Oliver and Boyd*, 1961. 6×9 *inches; maps and plates.* 30*s*

By pulling together the literature, and providing us with a descriptive account of the variety and the distinctive qualities of the mineral wealth of Wales, Mr. Thomas has performed a valuable service. In particular, his summary statement of the geological occurrence of the minerals—the term "minerals" used in its broadest sense to include limestone, sandstone, slate and the like, as well as coal, ferrous and non-ferrous deposits and gold—provides us with a useful source of reference. To this he has added some comments on the exploitation of these resources, a few notes on the economic aspects of production, and the occasional glance towards exploitation in the future. In these latter matters, however, it is an uneven work, and there are two major weaknesses. In the first place, there is a disproportionately small part of the book devoted to coal mining. Only thirty of the 235 pages are concerned with the South Wales coalfield (including the deposits in Pembrokeshire), and a further thirteen refer to the North Wales coalfield. Whether it is measured in terms of output, by its geographical extent, or in terms of man-power, the winning of coal completely overshadows all other mineral exploitation in the Principality. It could have been expected, therefore, that a book with this title would have been heavily weighted towards a discussion of coal. That this is not the case is the first major criticism. The second is partly related to it. Whilst Mr. Thomas writes about the markets for several minerals such as limestone or sand and gravel, no mention is made of markets when he discusses coal; whilst the author quotes the number of workers engaged in the mining of coal and the quarrying of slate, they are not discussed when he considers the other minerals. There is, in

other words, no uniformity in the way in which the different minerals are discussed. These criticisms, in short, amount to a feeling that the content and organization of the book could usefully have been subject to a more rigorous scrutiny. In spite of them, however, the book does make a valid contribution to the literature on Wales. The bibliography is up to date, and particularly welcome is the way in which departmental records of the Ministry of Housing and Local Government have seen the light of day—several of the chapters have obviously been based upon these—for there is too much good (and not particularly secret) material which lies unused in Government files. The book is amply illustrated by forty-seven maps, and a set of first-class photographs.

GERALD MANNERS

A SOCIAL GEOGRAPHY OF BELFAST. By EMRYS JONES. *London: Oxford University Press*, 1960. 6 × 10 *inches; 299 pages; plates, maps and figures.* 35*s*

This is one of the first full-scale studies of a British city by an urban geographer which is more than a description of its growth. It is a model of the careful use of cartographical and statistical techniques, applied to the principles and practice of urban geography; as such it will undoubtedly become a classic of its kind. Dr. Jones makes effective use of the census enumeration districts to compile nine detailed maps of the distribution of population, female employment and religious denominations. His fruitful analysis of such maps indicates the great general need there is in Britain for more detailed census data concerning our cities. It is farcical that in our urbanized society such data should not be more readily accessible. In addition, there is in this book a number of more original maps on the growth of the city and its suburbs, land use and population. The cartography is of a high standard, though the legend is not always clear, especially in Figure 73.

On this sound foundation of maps the author, trained in both geography and anthropology, raises his edifice, dividing it into five parts. First the physical setting is clearly outlined, then the growth of the town and land use are analysed. Part IV is curiously called "Social geography", dealing with population, industry and occupation and religion; surely, as the general title indicates, this is the whole theme? Finally, sectors of the city, industrial and residential, are traced historically and theories of growth are treated in relation to Belfast itself. All this, the author modestly points out, "reveals how much there is to be done, not only geographically, but in closely related fields, like sociology, social history and the economics of land values."

The crux of the argument in this work is to demonstrate the importance of personal motive and achievement on the one hand and the social values of human groups on the other, in moulding and transforming the urban landscapes and their regions. Thus the geographer "must look to the man rather than the place, to foresight rather than to site, and to initiative more than to the accessibility of raw materials" (p. 47). With this in mind the reader is a little disappointed not to have more data on the influence of the Donegall family and their estate on central Belfast, or of Harland on the industrial quarters. In the conclusion Dr. Jones comes down on the importance of social values in delimiting the basic patterns of the urban communities. One may wonder if this sociological emphasis is not one-sided; is man only a social creature, or is he also an economic one? The distinction is blurred in such terms as "socio-economic rank", used by the author. Might it not be conceivable that in some periods the economic emphasis is more important than the social one? Should therefore an attempt not be made to disentangle the one from the other? Or else, if it is decided that the two facets are so interchangeable that it is safer to balance both in any analysis, then more should be said about land economics, the sale of properties, the changing influences of various forms of inter-city transport, etc. Such criticism is prompted by the very stimulus of this book. Undoubtedly, it is a masterly piece of work.

J. M. HOUSTON

GERMANY. By T. H. ELKINS. *London: Christophers, Chatto and Windus*, 1960. $7\frac{1}{2} \times 5\frac{1}{2}$ *inches; 272 pages; sketch-maps, diagrams.* 12*s* 6*d*

This work must be assessed both from a professional point of view and in the light of the readers for whom it is intended—"students of geography in the higher forms of

schools and in the universities" and "others who are seeking a background knowledge of the land of Germany, its evolution and its problems". In about 100,000 words, with fifty-five maps (but no photographs), Mr. Elkins presents a "comprehensive" geography of Germany. Though the book is in general lucid and accurate, there are inevitably occasional errors; a major criticism concerns arrangement and content.

The reviewer, having written a larger work on Germany with precisely the same presentation, after much rewriting, is not likely to allow another work to pass that has the same essential defects as his own. The book falls into two equal parts: general (land, people and economy) and regional. Both are telescoped and congested. In particular, human distributions and the processes involved in them are inadequately tackled in the first half, and it is a pity that space was used apparently to go beyond what the author considers to be the "narrowly geographical". The regions are dealt with under ten divisions and many physical subdivisions. Much of this is well-ordered description on a physical base, and there is inevitably much factual repetition from one area to another, e.g. of rural settlements, types of farming and towns. A work of this character and length should be one thing or the other, and the general or systematic approach of the first half, better developed in its human aspects, would give a more adequate geographic presentation and would also give better understanding of the German problem to the reader.

Secondly, there is, in my view, too strong an emphasis all through on geomorphological and geological terms for their own sakes, beyond what is needed for appraisal of the human distributions and their development and significance. Many terms could well be simply omitted without any loss of understanding of their geographical significance. Descriptive terms for relief are notoriously confusing, and it is difficult to accept the name of "Uplands" for an area that includes the rugged relief of the Eifel. The first map in the book, on page 2, purporting to show the position of Germany, is in fact a simplified map of structural divisions of western Europe. It is just as perturbing to find prehistory telescoped into one or two paragraphs (p. 47). This should be properly developed or omitted in its entirety. In brief, my belief is that this book, which turns out to be a rather conservative geography text, would have been a more effective introductory work on Germany if the author had given more attention to objectives, presentation and selection. There is every reason why the "narrowly geographical" approach should be adhered to when directed to the specific human problem of a country and its people.

ROBERT E. DICKINSON

STADTREGIONEN IN DER BUNDESREPUBLIK DEUTSCHLAND. *Forschungs- und Sitzungsberichte der Akademie für Raumforschung und Landesplanung*, Band 14. *Bremen: Walter Dorn Verlag*, 1960. 10×7 *inches; 237 pages; maps*

This book consists of detailed research on problems of urban geography in West Germany. Six authors contribute chapters on different aspects of this subject. Dr. Olaf Boustedt's general introduction is followed by his own essay on the urban regions of the Federal Republic. It is illustrated by a valuable map which marks the urban nuclei and also the *umland* or surrounding dependent region of each town. The urban areas are divided into five carefully defined categories, each marked by a different colour on the map. The importance of these areas in relation to commuters and their daily journey to work is obvious. Dr. Werner Matti's essay is a special study on the economic and social structure of inner Bremen, and the connection of its various parts with the *umland* of the whole town. Similarly, Dr. Peter Möller's interesting study is confined to certain aspects of the geography of Hamburg. These chapters are followed by three essays which are more theoretical in character and have a general application. Dr. Georg Müller writes of the problems of the town and its *umland* as a feature of scientific urban research. Dr. Werner Witt deals with the question of the urban region and regional planning. He makes some valuable comments on the use of the word "region" in which he cites several British authors, including Professor E. G. R. Taylor. Dr. Karl Haubner's essay is notable for its account of earlier German workers in the field of urban geography, especially of J. H. von Thünens and that great pioneer J. G. Kohl in the first half of the nineteenth century.

E. W. GILBERT

STUDIES IN HUNGARIAN GEOGRAPHICAL SCIENCES. Ed. by G. MIKLÓS. *Publishing House of the Hungarian Academy of Sciences in Budapest*, 1960. $9^{1}/_{2} \times 6^{1}/_{4}$ *inches; 84 pages; maps and plates*

The seven essays in this book are the translated and printed papers given by the Magyar geographers at the International Geographical Congress at Stockholm in 1960. The first, on interglacial geomorphological problems, and the last two on cartographical subjects, are published in French. The other four are in English, and all have a Russian *précis* at the end. Other collections of essays for the International Geographical Congresses have appeared from East Central and Eastern Europe, those from the U.S.S.R. and Poland, four years ago, and that from Rumania which also was compiled for Stockholm. One cannot but be struck by the similarity of emphasis in geographical work in all these countries. The attention to physical geography is conspicuous: the Hungarian volume contains work on loess formations, on the morphogenesis of the Danube valley in Hungary, and on karstic landscape forms in Hungary as well as the paper in French already mentioned. This kind of solid geographical information based on good field-work is wholly welcome. Knowledge of the physiography of the Middle Danube Basin, and literature on it, are scarce in this country, and the problem of using Magyar sources is considerable. The whole controversy over the various origins of loess deposits is a live one today, and the Hungarian lowlands and Transdanubia offer great opportunities for work on them. The papers on the Danube valley and the karstic formations have excellent accompanying black and white diagrams, providing illustrations to this kind of field-work which have not been available to English readers before.

The preoccupation with land use in Hungary and its connection with cartography are easy to understand, and Dr. Enyedi's comments, together with the sample section of a land use map in black and white, are interesting. The reference to the usefulness of the Land Utilization Survey in this country as a precedent, as well as to Polish experiments, is pleasant reading for British geographers. The comment on the proposed National Atlas of Hungary is little more than an amplified summary of contents at this stage, but the appearance of the first sheets will be welcome.

Some aspects of geography seem too sensitive yet for handling in an authoritarian State, and the problem applies to all the volumes published up to now. The great themes of the past, the struggle between the Asiatic and European groups for the control of the steppic basins, the land reclamation schemes of the great families, the development of Danube navigation and of the manufacturing economy of Budapest remain, perhaps, for a later generation. So many episodes in historical geography in this part of Europe are quite spectacular in their importance to the subject. Many will hope that security and prosperity will enable a detached view of these happenings, which in themselves could stimulate a vivid form of historical geographical study.

HARRIET STEERS

ASIA

THE HOLY SWORD. By ROBERT PAYNE. *London: Robert Hale*, 1961. $9^{1}/_{4} \times 6$ *inches; 288 pages; maps and illustrations.* 35*s*

The author of this book claims that it is "the first attempt to write a reasonably complete history of the Arab conquests from the beginnings to the present day". The ordinary reader may well be puzzled by the idea of a cultural history of conquest, but what he will, in fact, find in this work is a popular history of Islam. The main emphasis is on the military achievements of the Muslim conquests, and as regards religion, Mr. Payne is obviously more interested in the Sufi and other mystics, than in the orthodox followers of Muhammad. More space might well have been given to the organization of the Muslim empire. He is inclined to be led away by his enthusiasm into purple patches as, for instance, when we read of "the sweep and roar and fury of Arab history".

The first hundred pages deal with the Prophet and "Muhammadanism" (an ugly word, which has no justification in Arabic, and is better avoided). The Umayyad and

Abbasid caliphates occupy another hundred pages, leaving a disproportionately small space for the Middle Ages, the Fatimids, the Crusades and the Turks. To complete the picture, the final chapter summarizes the lives of Muhammad Ali, Abd al Qadir the Algerian, Arabi Pasha, the Mahdi, the Bab, Ibn Saud and Colonel Nasir. The author has not apparently consulted a classic of modern Middle Eastern history *The Arab awakening* by George Antonius, from which a clearer picture of recent times might emerge. The book has two just adequate maps, numerous illustrations, a glossary and a bibliography. It furnishes a useful introduction to Islam, with a proviso that the reader may not always distinguish between legend and history, nor may he agree with the author's judgements.

STEPHEN NAISH

CROSSROADS: land and life in south-west Asia. By GEORGE CRESSY. *Chicago—New York—Philadelphia: J. B. Lippincott*, 1960. 10×7 *inches;* 593 *pages; coloured endpaper maps, plates, text-figures.* $12.00

This book is the latest addition to the Lippincott geography series. In his foreword Dr. Cressy indicates that his book has been written around three principal ideas—the crossroads character of south-west Asia, the role of water in its economy and the way in which man is changing the landscape, but a much wider range of subject matter is discussed. It is doubtful whether there is another book on the Middle East today which is so lavishly illustrated with photographs, maps, tables and climatic charts, and these add to the value of the text. The book is in two parts. The first part describes the geography, the peoples and their history, the land structure, the climate, irrigation, the use of the land, livestock, mineral sources and oil exploitation. The second part describes the countries of south-west Asia in detail, but here Egypt is also included—because of its importance in the Arab world—although in the first part it is excluded from the chapter devoted to peoples and their history. Israel is given a separate chapter from the Arab States of the Levant, which are treated as a geographical unity.

The book discusses the political problems of the area, particularly those which have a geographical and economic connection, and the author's views are balanced and impartial. Throughout the text, the narrative is expanded with impressions of places and peoples which the author has obtained through extensive travels in the area. Some readers may not always agree, but personal impressions undoubtedly enliven the text which, in a work of this kind, can easily become dull and heavy.

The book will be of great reference value and is unlikely to be superseded in this country. On the other hand, the reader more specifically interested in the peoples themselves and their history can find ampler surveys in many of the books listed in the author's bibliographies, and his use of the term "race" may cause eyebrows to be raised in anthropological circles. There are minor inaccuracies. The destruction of the Marib dam, for example, did not occur in 542 B.C., but much later and in the Christian era. However, in a work of such accomplishment and such wealth of factual material these are slight blemishes.

H. T. NORRIS

INTRODUCING TURKEY. By CEDRIC SALTER. *London: Methuen*, 1961. 8×5½ *inches;* 184 *pages; endpaper maps; plates.* 21*s*

Few writers about Turkey nowadays bother to spell Turkish words and place-names correctly and Mr. Salter is no exception to this rule: the village of Aliağa on the Aegean, for instance, is disguised as "Alizga" (pp. 168 and 169). Nor is he more accurate with the Classical names which he frequently introduces, e.g. Bithynia is rendered as "Bythnia" (pp. 81 and 178). The author is also weak in historical geography, for he ascribes the "countless tumulae" (*sic*) in the plain of Antioch to "Phrygian kings, including Midas" (p. 119), who is thus transported 350 miles eastward from his homeland and traditional tomb on the plateau of western Anatolia. The author is no better guide to Turkey's natural history, for (p. 64), in spite of having spent many years on the Bosporus, he confesses his inability to identify the shearwaters which fly in flocks up and down that waterway; their ornithological name is *Procellaria puffinus yelkouan.*

The book, which the publishers describe as "not a definitive guide, but a comprehensive introduction to the country as a whole", is written in a breezy, journalistic style, with many personal reminiscences, as well as historical digressions culled from more scholarly works. The author visited many of the Hellenistic ruins of the Lycian shore, but none of the important Hittite rock-sculptures which abound on the Anatolian plateau. Thrace is completely ignored, except for a few bathing beaches near Istanbul.

J. H. MARSHALL-CORNWALL

THE GEOGRAPHY OF THE HITTITE EMPIRE. By JOHN GARSTANG and O. R. GURNEY. *Ankara: British Institute of Archaeology*, 1959. (Obtainable from 16, Bryanston St., London, W.1.) 11 × 8½ *inches;* 133 *pages; maps.* 30*s*

Garstang was one of the last survivors of a heroic generation of Anatolian travellers, which included Sayce, Ramsay, Hogarth, Anderson, Calder and Dawkins. They knew the place in Ottoman times, before the trains replaced the pony post, and when the dervish *tekkes* still had an influence like that of the Hittite sanctuaries. They were captured by the spirit of the country, and seemed to understand it as much by intuition as by scholarship. Certainly their work on its historical geography has never been surpassed for precision and insight. Garstang lived through and played a leading part in the great age of Hittite discovery, and his ambition was always to reconstruct the geography of Asia Minor as it was in the second millennium B.C. His special qualifications for this were a keen eye for landscape, a flair for recognizing important sites, and a close knowledge of the plateau from end to end. He accomplished much in his early books and later papers, but the subject was continually becoming more complex as further texts appeared, and his final notes have only now been supplemented and published by his epigraphic collaborator and successor in the whole of this field, Dr. Gurney.

The identifications are based partly on epigraphic evidence, partly on place-name survivals and partly on topographic exploration. A detailed map has been made, largely from Hittite itineraries, of the pattern of settlements in the bend of the Halys, around the capital Hattusas. The other map, covering all Asia Minor, shows the districts and larger towns. There will now be little dispute about the placing of Kizzuwadna in Cilicia, or of the Lukka Lands in Lycia, but it is certainly unorthodox to move Arzawa so far north, into Lydia, which is done on the strength of a brilliant analysis of the course of the campaign of Mursilis II. The relevant texts are carefully translated and marshalled, and all the arguments are fairly presented, with cautions at any doubtful steps. The entire work is a fine memorial to a lifetime of exploration and reflection.

W. C. BRICE

A PILOT SURVEY OF FOURTEEN VILLAGES IN U.P. AND PUNJAB By P. K. MUKHERJEE and S. C. GUPTA. *London: Asia Publishing House*, 1960. 9¼ × 6 *inches;* 197 *pages, tables.* 41*s* 6*d*

During 1954–5 the Agricultural Economics Research Section, Delhi School of Economics, University of Delhi, carried out a survey of fourteen villages in Meerut and Bulandshahar Districts of Uttar Pradesh, and Hissar and Rohtak Districts in Punjab. It was carried out to test questionnaires and train investigators for a larger project known as the Continuous Village Surveys Series. It is hoped to resurvey the same villages at intervals of five years in order to analyse the standard and functioning of the village economy, to study economic change, its factors and indicators, and to apply the knowledge gained in practical suggestions relating to rural planning. The selection of the villages was purposive rather than random, on the ground that the selection of villages known to be of different types would be satisfactory, since the object is to know qualitatively the nature and direction of economic change, rather than to know the quantitative magnitude of the change over a region or a province. (While the authors may adhere scrupulously to this limitation on the range of uses which the data can legitimately serve, there is some danger, the reviewer believes, that the results may be used,

explicitly or implicitly, as if they could be multiplied up to yield estimates for regions or States.) The tentative approach was to study the economy—and potentially its changes—by means of questionnaires.

The book consists of chapters describing the following in turn for the U.P. and for the Punjab villages: general information about the villages, population characteristics, occupational pattern, land and other assets, non-agricultural occupations based on all households; particulars of selected households, their land, stocks, financial and other assets and liabilities in more intimate detail, and production and current economic transactions. Appendices contain full statistical tables of the questionnaires used. Table 38, p. 76, is expressed in percentages, not in rupees as stated at the top of the page. The work is valuable, and already the results are so interesting that the reviewer looks forward eagerly to the results of the continuing survey.

A. T. A. LEARMONTH

SOIL MANAGEMENT IN INDIA. By H. R. ARAKERI, G. V. CHALAM, P. SATYANARAYANA, R. L. DONAHUE. *London: Asia Publishing House*, 1959. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 584 pages; maps, plates, text-figures.* 82*s* 6*d*

This well-produced textbook (for use in India) is by two high officials in State departments of agriculture, an Indian agronomist and an agronomist from U.S.A. engaged in a technical cooperation mission. It is well written—perhaps occasionally with a touch of condescension which may annoy some intellectually mature students, and illustrated by apt and beautiful, well-reproduced photographs. It contains chapters on soil and its use, farm mechanization and tillage, climate (rather general and out of date, considering how much work on agricultural meteorology and climatology is going on in India), organic and artificial manures, cropping systems, weeds and their control, irrigation, draining, soil and water conservation and a series of chapters on managing soils for the main food and such crops. The chapter on rice, for instance, has the following headings—Introduction, geographical distribution, climate and physiography, rice zones of India, soils (general), soil acidity, soil and water relationships, cultural practices, nursery bed and field management, manuring, the future of rice in India, summary, questions for revision, references. An excellent book for its purpose; its interest to the geographer or general reader interested in India is considerable, but a by-product.

A. T. A. LEARMONTH

TIBET IS MY COUNTRY: the autobiography of Thubten Norbu, brother of the Dalai Lama, as told to HEINRICH HARRER. *London: Rupert Hart-Davis*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 264 pages; map and plates.* 25*s*

This book enthralled the reviewer with its accounts of the ways and happenings during the past thirty years, which have ended so hardly for ravaged Tibet. Though the story was originally told in Tibetan to Heinrich Harrer, the writer of *Seven years in Tibet*, and published in German, it has been put across very effectively in this English translation by Edward Fitzgerald.

Thubten Norbu and his younger brother the Dalai Lama were born some 500 miles inside China, yet they grew up in an entirely Tibetan atmosphere. The greater part of the book tells of a happy boyhood and later of hard study in remote Buddhist monasteries in the same neighbourhood. For many years Thubten Norbu particularly studied logic and debate, and when later he met Chinese aggressors (notably Chou En-lai) in India he doubtless presented Tibet's case clearly and strongly—if unsuccessfully.

His first trek of three months with a huge caravan from his home district to Lhasa, before the invasion, was on the whole a cheerful episode in contrast with subsequent journeys of himself and the Dalai Lama which were, inside Tibet, anxious escapes; it is distressing to read of the suppression of this peaceful religious culture—too static though it may have been. The story is a powerful reminder of the need for such help to the Tibetans as may be practicable.

C. H. SUMMERHAYES

CHINA'S POPULATION: Census and vital statistics. By S. CHANDRASEKHAR. 2nd edition. *Hong Kong University Press (Oxford University Press)*, 1960. 9 × 6 *inches; 74 pages; maps and tables*

"In Chinese demography even a little light is better than none" says the author, who is Director of the Indian Institute for Population Studies. The 1953 figure of 583 million Chinese, or 602 million with those in Taiwan and overseas, astonished the world when it was published in November 1954; previously almost all the "reliable" estimates were around 400 million. At once people began to say the new high figure was "propaganda"—implying that all propaganda was inevitably false. Chandrasekhar argues that the figure is reasonably accurate. It refers to one day, 30 June 1954, but as China lacks the millions of enumerators necessary to take a one-day census it took over a year, and heads of households had to call at an office to be recorded and—significantly enough—receive voting powers. The five questions asked were relationship to the head of the household, name and address, sex, age and nationality. Literacy was not measured, though it appears to be about 37 per cent. of the population.

Surprisingly, only 13·3 per cent. of the population is in towns, meaning places having over 2000 people in which at least half the population is non-agricultural. Equally surprising, perhaps, is the conclusion that the expectation of life at birth is 54 years, compared with 35 in India. And the natural increase adds 20 million people a year, so that by 1958 the population was 673,000,000. For 1957 the birth-rate was 34 per 1000, and the death-rate 11; it is hard to believe that in Shanghai and Peking the death-rates were only 7 and 6 per 1000. Apparently several factors favoured increases in 1958: there was the first political stability for over a century, and even the loss of perhaps a million in Korea from 1950–3, of 500,000 refugees, a few thousand suicides and several million executions, did not have any substantial statistical effect. For ten years China was free from famine; health and sanitation improved; hospitals were built; and marriage was universal. So far, so good, but what comes next? Fortunately Dr. Chandrasekhar has promised a fuller treatment of China's population. T. W. FREEMAN

RETURN TO JAPAN. By ELIZABETH GRAY VINING. *London: Michael Joseph*, 1961. 9 × 6 *inches; 288 pages.* 21*s*

From 1946 to 1950 Mrs. Vining was tutor to the Crown Prince of Japan and the story of those years has been charmingly told in her previous book *Windows for the Crown Prince*. She then saw modern Japan from a viewpoint unique for a Westerner, but of necessity lived a life isolated both from the vast majority of the Japanese and from her fellow Americans in Japan as tourists. It was not till she went back to Japan in 1957 to attend a PEN conference and travelled extensively that she came into direct contact with those aspects of Japanese life well known to, but so little understood by, the ordinary visitor—the Geisha party, the routine of the Japanese hotel, and *kabuki*. In 1959 came her much-publicized visit as the only non-Japanese guest invited to attend the Crown Prince's wedding. Japan will probably always remain an enigma to the Western mind; underneath the superficial change exemplified by modern cities and industry there is a cultural heritage so strong that one feels Japan has changed less in the last fifty years than any country in Asia. Mrs. Vining writes easily, with wide knowledge, sympathy and appreciation and her book is one to be enjoyed as well as one which should lead towards a better understanding of the Japanese people.

L. DUDLEY STAMP

AFRICA

A SKETCH-MAP ATLAS OF NIGERIA. By H. O. N. OBOLI. With notes and exercises. *London: George Harrap*, 1960. 9½ × 7 *inches; 47 pages; 4*s *6d*

Sketch-map atlases provide excellent means of instruction in the elements of the geography of a region and may be invaluable in the lower forms of secondary schools. This particular atlas is meant to serve the Nigerian market and, with its comparatively simple and clearly drawn maps, should be a welcome addition to the apparatus for teaching geography in most schools. It may also be of some interest to pupils in

British schools where some more detailed study is to be undertaken in African geography. The maps are a little crude even by "sketch-map" standards and might, with advantage, have kept the same outline. Some points of criticism with regard to their contents may be made. Firstly, temperature maps comparing rainy and dry season conditions might be more useful than a map of annual means. Secondly, "savanna" does not necessarily mean "tropical grassland" or even "grass plus trees", particularly in the Nigerian context, and the "typical plants" of the Guinea savanna should include the two most common in the southern portions, namely *Daniellia* and *Lophira*. The map of major food-crop regions is confusing and, whether it is meant to show the total or the major areas under a crop, it has several errors, and omits two important foodstuffs, cocoyams and plantains. There are other false impressions, including, for example, the huge extent of groundnut production in southern Bornu without the producing areas close to the northern border, the shapes of the main cotton and benniseed growing areas and the network of motor roads, which fails to give a good impression of the differences in road density between the three regions. To quote population estimates from 1921 to 1958, and to suggest that the differences in totals indicate growth unqualified by census error, seems again to be misleading. Although these are no more than sketch-maps it is particularly important to give sound impressions in the junior forms and not to create new "distributions" in Nigeria's geography by the crudeness of one's drawing. The idea of a sketch-map atlas is sound, but the maps need more careful draughtsmanship.

W. B. MORGAN

THE DEVELOPMENT OF THE TRANSPORTATION PATTERN IN GHANA. By PETER R. GOULD. Northwestern University Studies in Geography, No. 5. *Evanston, Illinois*, 1960. 9 × 6 *inches;* 165 *pages; maps and diagrams*

The contribution of American geographers to African research is rapidly increasing. This monograph is an outstanding work in the field of transport geography and demonstrates the abundance of material available in Africa to research workers who, like Dr. Gould, know where to look for it. The text is illustrated by 113 maps and diagrams, providing a thorough analysis of Ghana's transport system. Excellent use is made of historical material to illustrate the movement of goods even as early as 1900 and the author uses a great variety of methods of presenting his material, a few of which involve some knowledge of advanced mathematics for proper appreciation by the reader. The Government survey of the movement of goods by road, made in 1957–8 and unique in Africa, provided vital material for the general present-day picture; not content with that, the author made his own surveys in three sample regions in order to show daily movements in relation to local markets and to the general pattern. The "commodity flow" maps for each of three days of traffic to Bawku in the Northern Territories are amongst the most instructive in the whole work and show clearly the daily change in the shape and size of the Bawku *umland*—a warning with regard to generalizations based on long-term figures.

Ghana's transport problems provide a fair example of those of most territories in Africa. The railway was built in the first three decades of this century, in part to serve military and political needs and in part to serve mining and later cocoa. It made possible the rapid expansion of export crop production which led to the building of roads to serve as railway feeders. By the beginning of the Second World War road transport services could feed the ports directly and at a lower cost per ton-mile, but their expansion was hindered by a policy of railway protection and later by the restrictions imposed by the war. In the post-war period road transport has become increasingly important for the movement of foodstuffs, particularly yams, grain, groundnuts, kola nuts, bananas, rice, fish and salt, but is still mainly complementary to the railway in cocoa movement, which is largely regulated by the Cocoa Marketing Board with uniform prices at railhead. Such control is a vital factor in Ghana's economic geography, particularly with the increased concentration on the two major ports and the shift of economic activity north-westwards to the new areas in Ashanti and the Western Region.

W. B. MORGAN

CONTRIBUTION A L'ÉTUDE GÉOGRAPHIQUE DE L'HABITAT ET L'HABITATION INDIGÈNES EN MILIEU RURAL DANS LES PROVINCES ORIENTALE ET DU KIVU. By JEAN ANNAERT. *Bruxelles: Académie Royale des Sciences d'Outre-Mer, Classe des Sciences Naturelles et Médicales, Mémoires in-8, nouvelle série, tome X,* 1960. 9½×6½ *inches;* 162 *pages; maps, diagrams.* F. 300

This detailed account of the dwellings and settlements of the different tribes of the eastern part of the Congo provides indispensable information for those concerned with improving African living standards. Thus, the descriptions of the relationships between the form and lay-out of the huts and the customs of the people help to explain the unpopularity of the large airy brick buildings advocated by the administration and the reluctance to accept the nucleation of huts into villages where medical and educational facilities can be more readily provided. The author shows that, with only limited resources for home comforts, simple tribal folk prefer small warm huts of wattle and daub to large but cold brick buildings; only among the more prosperous are the large buildings likely to find favour.

The author classifies the settlements according to whether they form nucleated villages, straggling one-street villages or are dispersed. He distinguishes between huts with distinct walls and roofs, of rectangular or circular form, and those in which the walls and roof are in one, i.e. of the "beehive" type. Combining the classifications he recognizes five zones. Both the predominant settlement form and the type of hut are shown on an accompanying map, from which it is clear that the nucleated villages are found in a belt extending southwards from Stanleyville and the dispersed settlements in the north in a belt extending westwards from Lake Albert. The author comments that the nucleated villages are a feature of the savanna woodland zone. He also notes certain differences in the building materials used in each type of country, but he admits that there is not a close tie-up between dwelling and environment, buildings of different types occurring in each vegetational zone.

The grouping of the settlements and the types of construction are described in great detail for many different tribes and many different villages within each zone. The descriptions are accompanied by fifty-five ground plans and elevations and by 177 excellent photographs. All the villages are shown on the map. The text is thus easy to follow. There is, however, considerable descriptive repetition. By the portrayal of the living conditions of the peoples of the eastern part of the Congo and of Kivu this book provides a valuable addition to the geographical literature of Central Africa.

MONICA M. COLE

FROM THE HANDS OF THE WICKED. By TONY LAWMAN. *London: Robert Hale,* 1960. 8½×5½ *inches;* 191 *pages; maps, plates.* 18*s*

David Livingstone's fame has perhaps tended to obscure the achievements of those who came after him, and a biography is welcome of Frederick Stanley Arnot, whose mission work and travels in Central Africa were directly inspired by the older man. Arnot, who had been friendly with the young Livingstones in his childhood, arrived at Durban in 1881, unattached to any particular mission but determined to make for the Zambezi. He travelled first with F. C. Selous, crossed the Kalahari with a guide provided by Livingstone's friend Kama and, after a short stay in the Barotse valley, made his way to Benguela on the coast of Portuguese West Africa. Arnot's most important journey was the one he undertook next which opened up a new route from west to east, past the sources of the Zambezi (which he was the first to locate) and into the copper country of Garenganze, which we know as Katanga. He stayed here some years at the court of the redoubtable Mushidi, and it is Mr. Lawman's belief that had Arnot not been compelled by ill health to hand over his mission to a successor from England, Katanga might now be part of the British Commonwealth. The territory was annexed in 1891 for the Congo Free State by W. E. Stairs who stole a march on Alfred Sharpe, the British emissary, and who clinched the bargain by killing Mushidi.

Those who like to think of Africa before the white man came as a paradise, and of

chiefs like Lewanika, of the Barotse, and Mushidi as Noble Savages, will not care for the verve with which Mr. Lawman describes the scenes of carnage and torture which the gentle Arnot was forced to witness. It may be that rather too much prominence is given to this aspect of old Africa, but Mr. Lawman has played fair in basing his tale on contemporary accounts. *From the hands of the wicked* may be more justifiably criticized for its somewhat disjointed narrative, and lack of either precise geographical detail or historical background; there is, for instance, only one very elementary map. Like his master, Arnot was a geographer as well as a missionary, and in 1889 he received the Cuthbert Peek Grant from the Society "in recognition of the interest and value of his seven years' travels in Central Africa". In the same year he was given the Murchison Grant "towards providing and conveying a suitable present to the Chief Chitambo, of Ilala, as a recompense for his services in connection with the removal of the body and personal property of Dr. Livingstone, in 1873". DOROTHY MIDDLETON

SERENGETI SHALL NOT DIE. By BERNHARD and MICHAEL GRZIMEK. *London: Hamish Hamilton*, 1960. $9\frac{1}{4} \times 6\frac{1}{4}$ *inches;* 344 *pages; coloured and black and white plates.* 30*s*

This absorbing book with its magnificent illustrations and fascinating accounts of tracing the migration of wild herds in the Serengeti Park, just inside the northern borders of Tanganyika, is a translation from the German by E. L. and D. Rewald and starts with an introduction by Alan Moorehead. This area supports the last great concentration of wild animals in the world and is used as a migration route by great hordes of wild game. These were counted from an aeroplane by Dr. Grzimek and his brilliant young son, Michael, and found to number 367,000. The methods employed and views of the animals themselves are shown in the well-known documentary film *No room for wild animals*. Just as he and his father were finishing their survey of the animals in the Serengeti, a vulture flew into the wing of the plane which Michael, aged twenty-four, was flying, and he was killed. The book is dedicated to his children and there could be no better memorial. Recent political events in Africa give a special interest to this work, which can be thoroughly recommended to anyone who would like to know more about the wonders of African wild life and the country in which they are found.

EDWARD HINDLE

NORTH AND SOUTH AMERICA

LATE PLEISTOCENE ENVIRONMENTS OF NORTH PACIFIC NORTH AMERICA. By CALVIN J. HEUSSER. *New York: American Geographical Society*, 1960. $10 \times 6\frac{1}{2}$ *inches;* 308 *pages; maps, text-figures, plates.* $6

Dr. Heusser has built his interpretation of late Pleistocene environments around the study of 114 pollen profiles, which he obtained from sites located along the coasts from western Alaska to northern California. The nature of the material with which he worked has resulted in an emphasis on plants and their indications of temperature conditions in terms of long-term trends and general patterns. When he leaves the plant world the author seems to rely too heavily on the work of others, with little critical comment or assessment. The book would have suffered little if Dr. Heusser had confined his attention to the results of his own original research, and where he does this he makes a major contribution to understanding late Pleistocene events. After the introduction, the early part of the book provides background material on climate, physiography and regional vegetation. These chapters could easily have been condensed, and presented as summaries such as that found at the end of chapter three on climate. Chapter five is an elementary history of the study of palynology, and it is not until chapter six that the original research begins to appear. The techniques and methods used in the study are explained to allow assessment of the validity of the results, and in the two succeeding chapters the pollen profiles are analysed and interpreted. It is in this section that Dr. Heusser makes his greatest contribution, presenting a meticulous study of the late Pleistocene conditions, though he enters a very controversial field in insisting upon refugia during ice advances to explain some

of the vegetation patterns. Two pages at the end contain very useful suggestions as to the relevance of the findings to the study of early man in North America. The two appendices describe the sites where the borings were made and the general physiography of the north Pacific coast. The book ends with a glossary, a reference list, and the plates. No student of the Pleistocene can afford to ignore Dr. Heusser's conclusions and his correlations with late Pleistocene events elsewhere. The work fills an important gap, and provides a valuable starting point for further detailed studies in this area.

GRAHAM HUMPHRYS

INDIAN LIFE IN THE UPPER GREAT LAKES. By GEORGE IRVING QUIMBY. *University of Chicago Press*, 1960. 9½ × 6½ *inches; 182 pages; maps and plates.* 48s

As the author says in his preface, "this book was not written for the specialist". Nonetheless, it is the product of a specialist and as a survey covering 13,000 years it gives a lucid and simple account of Indian life during this immense period; of the geological and geographical conditions that shaped that life; and of the methods used to establish the information that now exists. The author traces the life and movement of Indian tribes over an area of more than 200,000 square miles, yet despite the paucity of data, a clear picture of Indian development emerges. Each chapter deals with a particular phase of Indian development over the period (11,000 B.C. to A.D. 1800) and the system of giving references at the end of the chapter makes it a valuable guide book for students.

To the non-specialist the last six chapters, dealing with the Indians between A.D. 1600 and A.D. 1820—when they came into contact with the white man and their cultures were changed and destroyed as a result—are by far the most interesting. This part deals with history as opposed to prehistory and relates a familiar story in precise, factual terms. The weakness of the book lies in its depth of presentation. It is not a specialist's book yet it goes into far more detail—of glaciation, carbon dating, types of stone arrowheads etc.—than a lay reader, merely interested in a general picture of the Upper Great Lake Indians, could probably digest. *Indian life in the Upper Great Lakes* is finely illustrated with maps, photographs of archaeological specimens and remains and reproductions of drawings. It also contains a glossary and bibliography (as well as the listed references after each chapter).

GUY ARNOLD

FRONTIER AMERICA. By THOMAS D. CLARK. *New York: Charles Scribner*, 1959. 9½ × 6½ *inches; 832 pages; maps, plates.* 70s

This is a great summary of the century and a half during which North America changed from a primitive wilderness, ranged over by an immense fauna and a few human beings barely out of the Stone Age, through a pastoral stage that only matured to the present highly developed economy in the late nineteenth century. The author details the whole stirring story from that of the settlers moving west from the old colonies over the Appalachians, their incompatibility as agriculturalists with the hunting Indian fur trappers, and the attempts of the British Government to restrain expansion into Indian areas. These were ill received and doubtless contributed to the discontent that exploded in the revolt of the colonies when they were freed from the fear of the French. At this time and after many of the Indians were loyal to the British Crown. Thenceforth the author describes the active settlement of the area to the Mississippi and the Great Lakes, the clearing of the forests and the change to agriculture and even to incipient industrialism. Settled government came quickly, organized on the old English county model with a county seat, Sheriff, and Lieutenant to command the militia. The great rivers now served as outlets for the produce of the new territories, much of which found its way to New Orleans.

The problem of communications is clearly described. Lewis and Clark, the first American explorers to cross the continent, took months to row up the Missouri in 1804. River navigation was an immense factor in the spread of trade and population to the west. Meanwhile a second generation had matured east of the Mississippi and hived off again west to the new State of Missouri and elsewhere between the two great

rivers. Then came westward expansion over the great plains and Rocky Mountains to Oregon and the migration of the Mormons to Utah, with the growth of the cattle economy of the south-west, and the rush to the precious metals of California and Nevada, subsequent to annexation by the U.S. after the Mexican war of 1846. The author does not mince matters relating to the treatment of the Indians, and places much of the blame on the lack of a coherent Government policy.

More might have been said of Colonel Kearney's great march with a detachment of his own 2nd U.S. Dragoons to the conquest of California in 1846. He himself was wounded in the one brisk action on arrival in California and a question of military subordination arose when Frémont the explorer, and Gold Medallist of this Society, arrived from the north with an irregular commando and claimed to be civil governor. The reproductions of contemporary scenes are delightful, and the sketch maps of each phase of expansion, informative. A more conventional map of the U.S.A. would perhaps be useful. These, however, are minor comments on a most instructive history.

WARIS AMEER ALI

GRINGO REBEL: Mexico 1913–1914. By I. THORD-GRAY. *University of Miami Press*, 1960. 9 × 5¾ *inches;* 487 *pages; endpaper map, plates.* $6.50

General Thord-Gray, a Swedish-American soldier of fortune, has fought under many flags, including the British—for which we can be grateful, as he is clearly a most remarkable character. We can also be grateful that he involved himself in the revolution and civil war which overthrew the regime of Diaz and Huerta and founded the modern Mexican State, for he has much of interest to say about it and about Mexican conditions at that time. The items of general interest, however, have to be looked for in a long and rather disjointed narrative of personal adventure in confused guerrilla warfare, during which the author was in as much danger from his own side as from the enemy. The story, too, is told in a style which is not inspiring, though at times amusing in its artlessness. Phrases like "Huerta had made many serious mistakes in the past, including murder", and the detached disapproval in his comments on atrocities (of which there were plenty on both sides) are reminiscent of the famous statement in the eighteenth century history that the Turks "sawed the commandant and the archbishop in two and committed other grave violations of international law".

For geographers the chief interest of the book lies in the passages dealing with the Indian tribes of the Sierra Madre, through whose country the author marched for months and many of whom he recruited for his forces. Fifty years ago these tribes—Yaquis, Tarahumaras, Tepehuanes etc.—still spoke their own languages, worshipped their own gods and fought with their own weapons (using bows and arrows effectively in the revolutionary army). He got to know them well—he witnessed some of their "magic" ceremonies and he has published a dictionary of the Tarahumara language—and to have won the confidence of these taciturn and suspicious savages is an achievement which ranks him as much more than an adventurer. There are a number of photographs (some very grim) and a sketch-map, which shows the author's wanderings over Mexico but not much else.

L. COLLIER

PLANTATION SYSTEMS OF THE NEW WORLD. Social Science Monographs 7. *Washington, D.C.: Pan American Union*, 1959. 10 × 7 *inches;* ix + 12 *pages*

Social and economic aspects of plantation agriculture are the main theme of this report on an international seminar held in San Juan, Puerto Rico, in 1957. It consists of thirteen papers of varying interest and quality, together with a brief introduction and the comments made in the discussions on individual papers. Several of the papers are concerned with broad generalization on such topics as "the plantation as a social system" or "the plantation as a socio-cultural type" and with, to the reviewer, somewhat theoretical problems of sociological classification. The central problem of defining what is to be comprehended by the term plantation is evidently in the minds of most of the contributing authors, though it is nowhere fully or even adequately discussed. In

general, social and economic definitions, stressing large-scale production of a single crop for export by a labour force employed by an authoritarian management well equipped with capital, tend to be favoured at the expense of definitions based on climate or type of crop. Yet, as one contributor points out, no adequate definition seems possible, for most of those accepted would either exclude many enterprises normally understood to be plantations or would also comprehend many other types of enterprise, including even some of the large farms of Europe or North America. It would therefore seem premature, to say the least, to identify social systems with plantation farming in general terms.

There are stimulating observations, made with reference to particular areas, on the relationships of plantation farming to population movement (in a paper by T. Lynn Smith) and family structure (in a paper by R. T. Smith). A brief and valuable summary of land tenure in Brazilian plantations is made by Manuel Diégues Júnior. I. C. Greaves considers the part played by plantations in world economy. While it is undoubtedly true, as she maintains, that they have been important instruments in the economic development of many unused or little used tropical and sub-tropical areas, they have often created serious social and economic problems where they have intruded into densely populated areas, and her discussions of possible alternative forms of exploitation seem oddly incomplete and even tendentious. A paper by J. M. Blaut on the ecology of tropical farming systems pleads for greater study of the rate of recuperation of eroded tropical soils, but both in this and in the final paper on skin colour and social class in Brazil compared with the U.S.A., interesting and stimulating though it is, the unifying theme of the plantation appears only very indirectly. In general, however, a number of interesting and controversial issues are raised, and there is much to stimulate further work, though mainly in a sociological direction. There is a useful bibliography.

C. T. SMITH

GALÁPAGOS. By I. EIBL-EIBESFELDT. *London: Macgibbon and Kee*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 192 pages; coloured and black and white plates.* 25*s*

This is a translation, by A. H. Brodrick, from the original German, and contains a good account of the interesting fauna and flora of these inaccessible volcanic isles which became famous through their connection with Darwin and his theory of evolution. The author, a zoologist, first visited the islands in 1954 as a member of the Hans Hass underwater expedition and more recently, under the sponsorship of the United Nations and the International Union for the Conservation of Nature, to establish a permanent wild-life sanctuary there for the study of its unique fauna. The giant tortoises, dragon-like iguanas and flightless cormorants exist nowhere else in the world, and the islands are the breeding resorts of many interesting oceanic birds such as the Galápagos albatross, frigate birds and gulls, and also of sea-lions. The curious habits of the various animals are described in detail, including their courtships and breeding behaviour. The Galápagos Islands were discovered by Spaniards in 1535 and the main islands have both Spanish and English names which are shown in the endpaper maps. A Charles Darwin Foundation for the Galápagos Islands has now been established with grants from UNESCO, the Gulbenkian Foundation and other sources, with the object of setting up an international research station in the archipelago and to set up nature reserves.

EDWARD HINDLE

AUSTRALASIA

AUSTRALIA, NEW ZEALAND AND THE SOUTHWEST PACIFIC. By K. W. ROBINSON. *London: University of London Press*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 340 pages; maps, plates, text-figures.* 25*s*

This is the fourth volume of *A systematic regional geography* of which the general editor, and author of the first three volumes, is J. F. Unstead. In 1935, when the first volume was published, it was intended that the fourth volume should deal with the southern continents. The series was styled a post-matriculation course and aimed at

providing a general course in regional geography suitable for students in training colleges and universities—a course which would "not only give facts" but "also provide a training in dealing with them". The fourth volume has been long in appearing, and it deals only with one of the southern continents. This is not surprising, for it must be all of thirty years since Dr. Unstead first planned the series and British academic geography has changed considerably during this period. The world of 1960 is also very different from that of 1930, and the position of the south-west Pacific in international affairs has also changed. The publishers do not tell us if the series is now complete or if we may expect other volumes. One suspects that it is now complete.

Dr. Unstead was very wise to hand the task of writing the present volume to Mr. Robinson, who holds the position of senior lecturer in geography at Newcastle University College in the University of New South Wales. It can have been no easy task to write the fourth volume in a series of which the first three volumes bear so markedly the stamp of the general editor. Mr. Robinson is to be congratulated on producing a useful work on the south-west Pacific. It will undoubtedly be used considerably by Australian students. It cannot be commended equally for use in countries beyond the region which it describes. It suffers from limitations of space; many of the statements require expansion and qualification if their meaning is to be appreciated correctly by students who have no first-hand experience of the Australian, New Zealand and South Pacific scene.

Following the pattern of Dr. Unstead's *Europe* (1939), the contents are grouped into three parts:—I General, II Regional and III The States. The most interesting chapters are seven to fifteen; in these the author sets forth a novel regional division of Australia based, it would seem to the present reviewer, on Unstead's triology of *stow*, *tract* and *region*. These chapters are full of detail and should be read with the relevant one-inch topographical maps at hand. Nine chapters are devoted to the regional geography of Australia, two to that of New Zealand and one to that of the other islands in the region. The proportion of space allotted to the various areas is scarcely satisfactory in terms of total populations. The maps are clear and easy to read, but several of the photographs suffer from too great a reduction. Finally, a word of criticism of the publishers. To announce on the dust cover that the volumes in the series "are designed for students following G.C.E. (Advanced Level), Training College, or first year University courses" is to condemn the series rather than to boost its sales. A textbook designed for sixth-form pupils and training college students does not provide the extra intellectual stretch so necessary for students in their first year at a university.

E. M. J. CAMPBELL

THE FIJIAN PEOPLE: economic problems and prospects. A report by O. H. K. SPATE: Suva Legislative Council of Fiji, Council Paper No. 13. *Suva: Government Press* [1959]. 13×8 *inches; 112 pages; map. 2s 6d*

At the root of the problems facing the Crown colony of Fiji in the second half of the century is the balance, or more simply the unbalance, of man and land. In 1874 at the time of Cession, Fiji was peopled almost entirely by Fijians, who are believed to have numbered about 200,000. At the last census (1956) they numbered 148,134, and Indians, 169,403; together the two peoples comprised 91·8 per cent. of the total population. Both elements continue to expand, and the total population is expected to pass the half-million mark before 1966. Each year the numerical superiority of the Indians becomes more marked, due to the differing age-sex distribution of the two peoples. At the same time, in terms of land ownership the Fijians are still as dominant as at the time of Cession. Today 83 per cent. of all land in the Colony is still held under Fijian customary (i.e. communal) tenure and cannot be alienated. Six per cent. of the total area is Crown land; and less than 10 per cent. is freehold. The Indians who also look on Fiji as their homeland—most of them have been born in the Colony—have access to some 9 per cent. of the total area only; most of this they hold under short-term leases which are unsatisfactory to them and detrimental to the soil. The land-hungry Indians believe that the Fijians are not making the best use of their land. The Fijians envy the

apparent greater economic prosperity of the commercially minded Indians; many of them believe that their economic advance is hampered by their communalism.

Spate's brief was two-fold: (i) to assemble and assess such data as could be obtained on the economic activity of Fijian producers, with special reference to the effects of their social organization on that activity; and (ii) to consider how far the Fijians' social organization may be a limiting factor in their economic activity, and to suggest in what ways changes in that organization might be desired. His report is full of useful information for the geographer interested in Fiji and the Fijians. He reviews in detail the structure of Fijian society, paying attention to administration, land tenure, housing, and economy. Spate visited fifty-two villages dispersed throughout the Colony. He has included summary notes on them in the second appendix to his report. His "field" notes make interesting reading. One cannot help thinking that very often the Fijians with whom he spoke told him what they thought he wanted to hear. Fijians dwell on the borderland between Melanesia and Polynesia; Melanesians and Polynesians alike cannot be hurried. They are normally slow to take the stranger into their confidence. In no village, it seems, did he spend more than forty-eight hours. He found "widely-spread common attitudes on general problems, a true if rarely articulate *koro* public opinion" in spite of a great diversity among the villages visited "in social structure, economic base and/or organization, level of activity and leadership". He regards this as "all the more significant". The present reviewer finds the general consensus of opinion within the fifty-two villages most surprising.

Spate's main conclusion is that "the future for the Fijians lies in a turn from communalism towards individualism". This he says is "increasingly the direction desired by the people; most notably on Viti Levu, but, even if to a lesser extent, also in the islands". "One cannot," he continues, "be sure of success with a policy of individualism; but . . . one can be sure of failure on the opposite policy of communalism. Between a risk and a certainty of failure, there can be only one rational choice" (p. 96). The present reviewer wonders whether the choice is really as clear-cut as this.

E. M. J. CAMPBELL

POLAR REGIONS

90° SOUTH: the story of the American South Pole conquest. By PAUL SIPLE. *London: Putnams*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 384 *pages; maps and plates.* 30*s*

This book is something more than an authoritative and sensible account of the establishment of the American base at the South Pole; it is also an intimate review of the scope of American Antarctic exploration in the twentieth century with digressions into geographical hypothesis; it is a pity, though, that maps and proof reading are inadequate. Paul Siple served his appenticeship in Polar geography with Admiral Byrd between the wars, and he was with the first Byrd party which went south in a forty-six-year-old auxiliary (200 horse-power) bark, *City of New York*, scantily equipped, poorly victualled and, in the event, badly housed; however, as Siple says, "these . . . problems were not of tremendous concern because this was an adventurous expedition". Behind these difficulties and short-comings the pattern for the next thirty years of American Antarctic exploration was taking shape; even in 1928 air support was available, radio contact was accepted as a basic essential and tractors supplemented man- and dog-power. The Byrd expeditions proved that modern technology could help extend the frontiers of Antarctic knowledge in almost every application; only in one generation's time the American Antarctic expedition member would take heat, light, power in the air and on the ground for granted. He would expect to be well housed, well paid and all found; his interest in research would be inexhaustible, but his only link with the past would be with a handful of "'tween-war pioneers". Both Admiral Byrd and Paul Siple found themselves at times unwillingly cast in the role of the Ancient Mariner as they sought to condition and advise the inexperienced.

There is no doubt that of all the many activities of Operation Deep Freeze the building of a scientific station at the South Pole, by massive Globemaster airlift over a supply line thousands of miles long, attracted the greatest public interest; indeed, the

impact was as great on the student of Polar geography who, by 1956, was bemused by the political activities in the Antarctic which at times appeared far removed from objective scientific methods. Paul Siple may seem to us now to have been the natural choice for leader of the party of eighteen men who wintered at the Pole, though in practice this role was shared with Jack Tuck, the military commandant, and by reading between the lines of his sympathetic account of that first year's work it is quite obvious that his experience and understanding helped carry the South Pole party through the first winter. Many of the difficulties touched upon in *90° South* were the product of a complete lack of common ground between the International Geophysical Year and Service Committees in the United States; moreover, this schism reappeared from time to time in the field and blunted initiative also, but at the Pole potential causes of friction were foreseen and scotched by the leaders as they appeared.

The mounting of the South Pole station was planned as a military operation and the whole exercise was conditioned with all the advantages and disadvantages inherent in this system. An enormous weight of men and materials was directed, and at times misdirected, in order to attain first a foothold and then the permanent station; however, time and time again one reads that material potential was not in itself enough to ensure success, but that it required extraordinary efforts on the part of the expedition members as well, whether it was, for example, the skill and determination of the pilots, the almost superhuman labours of the construction gang of Seabees at the Pole, or the unreserved enthusiasm of all the young I.G.Y. scientists. Today we know that the South Pole station is still manned by the successors of Paul Siple's group, and the sure foundations on which the present research facilities are based were made in the pioneer mould in 1956/57 so engagingly described in *90° South*. DAVID STRATTON

MY POLAR FLIGHTS. By GENERAL UMBERTO NOBILE. Translated by Frances Fleetwood. *London: Frederick Muller*, 1961. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 288 *pages; maps, plates.* 25*s*

My polar flights at last gives the authentic truth about Umberto Nobile. After reaching the pinnacle of success by both designing the shapely airship *Norge* and piloting her across the North Pole to Alaska under appalling conditions in 1926, Nobile continued his scientific flying in the Arctic in 1928 with another ship called *Italia*. In his first 1928 reconnaissance, lasting sixty-nine hours, he flew east beyond Novaya Zemlya and in his second, renewed his acquaintance with the Pole. Snow, fog and ice formation were almost constant adversaries. It was on the return leg, when within 80 miles of North East Land, that disaster struck. Either through icing of the hydrogen valves or damage to the envelope, there was a sudden loss of lift and *Italia* crashed onto the ice with great force. Nobile received a head wound, and fractures of a leg and arm.

Through gross neglect of the captain of *Città di Milano* (the base ship anchored in King's Bay, Spitsbergen) none of Nobile's S.O.S. messages was picked up for nearly a fortnight—and then by a Russian amateur. In spite of the uncorrelated air efforts of Italians, Russians, Norwegians, Finns, French and Swedes, seven weeks elapsed before the main body of survivors were rescued by the Russian icebreaker *Krassin*. Nobile describes this terrible mental and physical ordeal without exaggeration.

There followed a commission of enquiry in Italy. It sat in secret, heard no evidence from Nobile, and at the end of a year proclaimed that the crash was due to his bad management and that he was wrong to have allowed himself to be rescued first. He was thus forced to resign all the honours which had recently been so liberally heaped upon him. In spite of this treatment at home, the Swedes invited him to Stockholm where they presented him with the first Andrée memorial medal. Little wonder that Nobile accepted a four-year contract to build and fly airships in Russia, which he did with success. Not until 1945, after the demise of Fascism, did another government commission sit, which exonerated him entirely for the *Italia* crash, and made some financial redress.

The Swedes, whose planes were the only ones to land near the marooned men, had had orders to bring Nobile off first, because he was the worst injured and because they

wanted him to direct the search. Nobile protested vehemently but was persuaded by his companions. As events proved, if he had remained, the others would not have been rescued. Then there was Amundsen's story that when they landed in Alaska in 1926, having been told to carry absolutely no personal luggage, Nobile and his officers had donned full dress uniforms which they had concealed in the ship. What actually happened was that the uniforms in question were standard Italian Army ones, worn under their flying clothing throughout the trip. At Teller in Alaska it was so warm that for the first time they took off their flying clothing and so appeared in uniform—not full dress but ordinary working uniform.

My polar flights is a story of skill and daring: a story of combat in polar skies by frail craft hurling themselves against wind and fog and ice: a story of a great Commander and a loyal crew missing, only by a hair's breadth, complete success, and almost without exception suffering their ordeal like men.

JOHN GRIERSON

PHYSICAL AND BIOLOGICAL GEOGRAPHY

PHYSICAL GEOGRAPHY. By ARTHUR N. STRAHLER. 2nd edition. *New York: John Wiley*, 1960. $10\frac{1}{2} \times 7\frac{1}{2}$ *inches;* 534 *pages; maps, diagrams, photographs.* 60*s*

This new edition of Professor Arthur Strahler's *Physical geography* is a complete revision of the first edition. It incorporates many suggestions sent in to the author and also covers numerous advances which have taken place in the last decade. Intended primarily for the American liberal arts college student of geography, a wide and all embracing interpretation is given to physical geography; we find that the elements of astronomy, geodesy, cartography, geology, hydrology and geomorphology are all covered. Although necessarily somewhat encyclopaedic in character, the book is packed with interesting and up-to-date information and is extremely well illustrated—very few of the five hundred pages are without several diagrams, figures, maps, graphs or photographs. Review questions are given at the end of each chapter and a select list of references concludes the book. There is little doubt that many first-year university and training college students in Great Britain will agree that this publication is indeed a "good buy".

Among the major changes in the new edition are the inclusion of chapters presenting the fundamentals of surface and ground water hydrology; descriptions of the Universal Transverse Mercator and the Universal Polar Stereographic grid systems; a supplementation of the genetic climatic classification of the first edition with Köppen's system; and new data upon the upper air westerlies, the jet system and the tropical easterlies. The necessity for geographers to recognize the importance of water development and conservation is emphasized by Professor Strahler in this new edition and a background of the fundamental principles of the hydrological cycle, including much data on soil moisture, ground-water and surface run-off, is provided.

W. G. V. BALCHIN

GEOLOGY: principles and processes. By WILLIAM H. EMMONS, IRA S. ALLISON, CLINTON R. THIEL and GEORGE A. STAUFFER. *London: McGraw-Hill*, 1960. 9×8 *inches;* 491 *pages; maps, text-figures.* 62*s*

The authors realized, in the revision for the 5th edition of this admirable book, that their attempt to include some fringe subjects might lead to superficial treatment. This is evident, for instance, in the treatment of tides, which makes no reference to daily tides which characterize the Pacific coasts of the United States. Very occasionally a poor diagram slips in, as that of the hypsographic curve on page 32, but this is wholly exceptional as the book is profusely and imaginatively illustrated. Professor Trueman reviewed the 2nd edition in volume 94 (1939) of the *Journal* (p. 76) and made several suggestions which have been subsequently incorporated, so that the present edition is a really balanced book, particularly for geographers interested in geomorphology. The geological chapters serve excellently as a basis for the geomorphology which constitutes

nearly half the book. The chapter on gradation by gravity is clear, with good diagrams and excellent photographs. Then follows an even better chapter on gradation by running water with a very good section on meanders. The transformation of snow into ice is well described in the following chapter, but less happy is the reference on page 264 to the enormous quarrying force resulting from the adhesion of ice frozen to rock. Ice is a very weak medium compared with unjointed rock, and under temperate glaciers the heat from the earth can cause sufficient melting greatly to reduce this cohesion. Also the heading "subsurface ocean currents" on page 300 should read "subsurface oceanic circulation". On page 308 cuspate shore forms are attributed to longshore currents, but the far greater importance of waves in moulding coastlines is fully stressed in an excellent little section on the vexed question of barrier beaches. Near the end the book returns to geology—structural geology—which concludes a book which should be in every geographical library. W. V. LEWIS

LEHRBUCH DER ALLGEMEINEN GEOGRAPHIE. By HERBERT LOUIS. Band 1, Allgemeine Geomorphologie. *Berlin: Walter de Gruyter*, 1960. 9½×7 *inches; 354 pages; text-figures, maps, photographs in accompanying brochure.* DM 36

During the twenty-three years since Maull's *Handbuch der Geomorphologie* first appeared there has been no completely new addition to the impressive list of geomorphological textbooks by German authors. But German thought and method in this field has undergone a radical change in these two decades with an ever-increasing emphasis being laid upon the varying denudative processes under different climatic regimes. The second edition of Maull's text in 1958 and the fifth and succeeding editions of Machatschek's *Geomorphologie* made it clear that a reappraisal of the entire subject was overdue. In this completely new work Professor Louis of Munich gives us a textbook which, though firmly rooted in the long tradition of German geography, gives a timely account of early American workers and of the full implications of climatic geomorphology.

After a concise statement of the aims, methods and development of geomorphology, a short section considers the coarser elements of the Earth's morphology—the horizontal and vertical distribution of land and sea, the geophysical make-up of the Earth's crust, the major types of rock, and the principles of structural geology. The section concludes with a summary review of theories to account for the shape of the Earth. The remainder of the work, covering 249 pages, is concerned with the detailed pattern of surface forms, the study of which is the main objective of geomorphology.

Four chapters describe the processes of weathering, denudation and erosion, laying particular stress on the complimentary role of surface denudation and linear erosion. The author distinguishes a variety of weathering, of slope development and valley form (*Kerbtal* and *Flachmuldental*) under different climatic conditions; the theme is developed in a following key chapter on the relief types of particular climates. The fluvial relief of extra-tropical, long-wooded regions, such as the Mediterranean, is adopted as the type example, for in such areas the processes and forms were least disturbed during Pleistocene times. Interpretation of the land forms as a reflection of climate is therefore less hindered by the presence of "fossil" morphology derived from earlier climates. There follows a description of relief forms in the frost climate of subpolar and subnival regions, in those extra-tropical zones such as Central Europe where the impact of climatic change has been profound, in arid and semi-arid areas, and in the tropics of seasonal or continuous rainfall. Only at this point in his review does Louis introduce structure and tectonics as factors of landscape shaping, and even then stresses their variations with climate. This noteworthy change of emphasis for a German geomorphologist accords with the author's view that an exhaustive treatment of the endogenic processes more properly belongs to a textbook of dynamic geology than to one of geomorphology. Thereafter, the book adopts the more orthodox pattern of earlier studies, with chapters devoted to karst phenomena, glaciation, wind as an agent of erosion and deposition, and its particular importance in deserts, coasts, the

morphology of the sea floor and volcanic land forms. The work concludes with a necessarily slight, but stimulating, review of man as a morphological agent.

This beautifully produced and richly illustrated work (the accompanying brochure of excellent annotated photographs is a most valuable feature) does more than collect together the concepts and literature of geomorphology. For the first time in a German textbook the viewpoint of the climatic geomorphologist has permeated much of the subject in a sober but profound manner. At the same time certain sections, such as that on wind as a morphological agent, and the formation, deposition and survival of loess, show the author's reluctance to leave the traditional approach. In building carefully on past work and eschewing the more extreme trends, Professor Louis has made an important contribution to the advancement of the discipline. It is to be hoped that this valuable work may soon be available in an English translation. P. D. TILLEY

GLACIERS. By ROBERT P. SHARP. Condon Lectures, Oregon State System of Higher Education. *Eugene, Oregon*, 1960. 10 × 6½ *inches; 78 pages; maps, text-figures and plates*

In the Condon Lectures Dr. Sharp has presented in a manner delightfully free from technicalities and formulae a happy little summary of recent additions to our knowledge of glaciers. In his modesty, Dr. Sharp conceals the fact that he and his assistants have themselves carried out the bulk of the work described in this booklet. This is some measure of his contribution to glaciology; and even in this brief but clear statement he by no means ignores the work of others. It is profusely illustrated, and the diagrams are clear and well chosen. The glacier budget is briefly introduced, then follows a short section on glaciers and climate, where the reader is taken by easy stages to the roles of radiation, conduction-connection and condensation in the wastage of ice or snow on some typical glaciers. Both the flow of glaciers and the structure of glaciers are referred to slightly more fully. The treatment makes the whole booklet most readable to students of geography unversed in science, yet fascinating peeps are given again and again of the precision and detail of modern work on glaciers, including the final section on the use of oxygen-isotope ratios to help unravel the life history of the snow, firn and ice incorporated in glaciers. W. V. LEWIS

HUMAN AND HISTORICAL GEOGRAPHY

ALLGEMEINE AGRAR- UND INDUSTRIEGEOGRAPHIE. By E. OTREMBA. Band 3, Erde und Weltwirtschaftsgeographie (ed. R. Lütgens. 2nd revised edition). *Stuttgart: Franckh'sche Verlagshandlung*, 1960. 9½ × 6½ *inches; 392 pages; maps, plates, text-figures.* DM 42

The title of this book might lead the reader to anticipate a formidable quantity of economic theory. This is not so, although due reference is made to the work of Thünen, Petersen and others on zones of agricultural intensity. Natural, not economic, factors are given primacy as far as agricultural distributions are concerned. Reference is made to the influence of the market, but relief, soil and climate are regarded as the prime determinants of agricultural margins "which are not to be crossed" (nicht zu überschreiten sind). Economic forces are given greater relevance in industrial geography, but even here location theory and any search for optimum location are regarded as falling outside the field of geography. Emphasis is placed rather on the description of the industrial structure of particular locations and regions in their spatial interrelationship.

If there is one major theme it is the landscape, industrial and agricultural. Yet these landscapes are not subjected to mere mechanical description, as lifeless material objects. They are inhabited; particularly in the two-thirds of the book devoted to agriculture the reader is never allowed to forget that farming is a way of life as well as an economic activity. Much of the material on rural population structure, on farm types or field systems would not be out of place in a work of social geography. The dif-

ference here is that these phenomena are considered not merely as forms, but in their complex interrelationship with the whole structure of farming. Not all economic geographers would accept Professor Otremba's approach to the subject, but all will read this scholarly and perceptive book with respect.

T. H. ELKINS

DIE STÄDTISCHEN FUNKTIONEN. By KLAUS-ACHIM BOESLER. *Abh. geogr. Inst. frei. Univ. Berl.* 6, 1960. 11 × 8 *inches;* 80 *pages; maps and text-figures*

It is easy to talk loosely about urban functions. Dr. Boesler will have none of this; to him, urban functions are economically measureable, or nothing. In common with a number of recent workers, he distinguishes between the local, or secondary, functions of a town, and the primary functions. Local functions are concerned with the provision of goods and services for persons within the town, primary functions with a similar provision for the greater world beyond. Only primary functions can produce the inflow of income needed in order that a town may live and grow. Dr. Boesler goes on to create a simple model in order to demonstrate the way in which variations in the extent of primary functions will be reflected after a lapse of time in the extent of secondary functions and ultimately in total population. On a similar basis he proposes an interesting scheme for a functional classification of towns.

All this could easily remain aridly theoretical, for it is well known that, at least in the West, it is extremely difficult to obtain an accurate notion of the proportion of a town's population serving more than local needs, let alone of any inflow of income that results. Dr. Boesler, however, working within the bounds of the "German Democratic Republic", was able to obtain specific data for twelve towns in Thuringia. He acquired figures of "primary" and "secondary" employment for individual firms and offices and was even able to estimate the inflow of income derived from non-local relations. He makes good use of his model and scheme of classification in providing a basis for comparison, carefully investigating any town that departs markedly from the ideal. Dr. Boesler makes no claim for more than local application of his theoretical ideas, but there is no doubt that they will be followed with great interest by urban geographers everywhere.

T. H. ELKINS

LAND FOR THE FUTURE. By MARION CLAWSON, R. BURNELL HELD and CHARLES H. STODDARD. *Johns Hopkins University Press; London: Oxford University Press,* 1960. 9 × 6 *inches; tables and text-figures.* 68*s*

Despite its title this book deals exclusively with the United States and is one of the series of studies now being produced by the resident staff and research associates of Resources for the Future Incorporated. This is described as a "nonprofit corporation for research and education in the development, conservation and use of natural resources". Founded in 1952, it is financed by the Ford Foundation. The United States, despite its 3,550,000 square miles and its present modest population of 180 million—a dozen times as much land per head as in Britain or Western Europe generally—is beginning to become aware of the basic problem of increasing pressure of an expanding population on a fixed space, which has forced physical planning on so many countries. Reasons are given for believing that by A.D. 2000 a population of 310 million will enjoy double the present *per capita* real income combined with much more leisure and greater mobility. The main part of the book, then, takes up each of the chief competing claimants for land—urban uses, recreation, agriculture, forestry and grazing, whilst "miscellaneous" uses include transportation (railways, roads, airfields), reservoirs and water regulation, mineral production and wild life. In a country like Britain, where the attempt to dovetail these competing demands has dominated planning thought and government action over the past twenty years, it seems strange to find this approach described as "unique". By standards elsewhere in what has become known as the Western World, the United States will remain very rich in land resources. A fascinating table (51, p. 442) summarizes the findings of the survey by comparing A.D. 1950 with A.D. 2000 in millions of acres needed—cities of

2500 and over from 17 to 40, public recreation areas from 46 to 95; agriculture to decrease from 523 to 503, forestry from 484 to 455 (but continuously managed commercial forests will increase from 359 to 405). Grazing land (still treated on traditional American lines as quite distinct from agriculture) will decrease from 700 to 680 and, happy thought, mineral production, deserts, swamps etc. from 85 to 60, leaving transport to use 30 instead of 25, reservoirs 20 instead of 10, and wild life to enjoy 20 instead of 14.

Whilst the careful analysis, remembering the vast increases in output being made possible by improving technical efficiency, heightens the present contrast with the more crowded parts of the world, there is much of the utmost value in this scholarly book to afford thought for all who are concerned with the world's most insistent problem—a world which is likely to see 6000 or 7000 million people by A.D. 2000 against the present 3000 million.

L. DUDLEY STAMP

THE DEEP SEA TRAMP. By A. G. COURSE. *London: Hollis & Carter*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 280 pages; plates.* 21*s*

LIVERPOOL SHIPPING: a short history. By G. CHANDLER. *London: Phoenix House*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 256 pages; 4 endpaper maps; plates.* 30*s*

Captain Course is well qualified to write about tramp shipping, having gone to sea in a square-rigged sailing vessel at fifteen years of age and having spent all his life with ships and sailors. After retiring from command of a vessel in the Far East he became a dockmaster in the Port of London Authority. We are indebted to him for putting on record so much first-hand information about tramp shipping. The story of the development is traced from the days in 450 B.C. when Greek ships sailed the Mediterranean on charter. By the time of Elizabeth I merchants still sailed the seas with their cargoes, but then supercargoes gradually became their agents. In the nineteenth century the word "tramp" was first used for these ships of general service. By 1910 half the British Merchant Navy was engaged in tramping and, despite the growth of specialized craft, tramps still play a major part in our commerce.

A section deals with the history of some companies and their ships and trade. On page 7 Captain Course draws attention to the qualities required of a tramp master—that he should be a diplomat, a lawyer, an accountant and a merchant—but leaves unsaid that he should be a master of his navigational skill and of men. There are many anecdotes dealing with the work of tramps during two world wars and one feels indebted anew to those who sailed in them. There is also information on the size, capacity, cargoes and costs of the modern vessel.

Dr. Chandler's book on the history of Liverpool shipping will appeal to all who are interested in the sea and ships. Less personal than the volume by Captain Course, it is packed with information which, because of trade connection, reaches world wide. The historical account of the port shows how closely its growth has been linked with the initiative and activity of the shipping companies based on Liverpool. Since 1857, when the Mersey Docks and Harbour Board was established, the trading has increased sixfold. The book has a comprehensive account of the coastal shipping with particulars of the companies and their fleets. The origin and development of sea routes to Europe and the Mediterranean is traced in similar fashion. This is followed by chapters on all the great routes of the world; in every case the historical background is both interesting and informative, and these tell clearly of the appalling risks taken by the early merchants and their energy in combating the difficulties and disasters which can befall traders. The firms which are the descendants of these merchant adventurers have the task of maintaining the same initiative and vision if Liverpool is to remain a great port. The volume ends with a discussion of future trends.

Both volumes are illustrated with excellent photographs and in addition Dr. Chandler's book has line-drawings of the funnel markings and house-flags of the companies which trade out of Liverpool.

A. C. O'DELL

BIOGRAPHY

OIL PIONEER. By A. BEEBY-THOMPSON. *London: Sidgwick and Jackson*, 1960. 9 × 6 *inches; 544 pages; plates.* 42*s*

Oil pioneer is the autobiography of Mr. Beeby-Thompson, much of whose long eventful life has been devoted to serving the oil industry. The method adopted in telling the story is chronological until 1904 when he had taken the plunge and established his firm of consulting petroleum engineers in London. Thereafter he treats region by region over the period, often lasting some decades through which he has watched and influenced its development. To a mere child like the reviewer—twenty years the author's junior—it is the stories of the bad "good old days" which appeal more than those nearer 1961, when seamy politics and sheer lack of good faith succeed the mosquito and the assassin as the main menaces.

The author was posted in 1896 to the "white man's grave", the Gold Coast, or (what's in a name?) Ghana, where human beings of whatever colour were the guinea pigs, and parasites, germs and viruses were the unknown reagents. Sixty grains of quinine per day was the known ingredient with alcohol galore as the recommended solvent. The book tells of a time when his temperature was 106° F during days on end, but this did not kill him as it did most folk after a few tours of duty. It may be inferred that such long spells of high body temperature did not have an enduring evil effect, or at least if they do it does not manifest itself until the subject is over eighty-eight years of age. A move to Russia in 1898 brought some new hazards. One queer one arose in the course of the journey there. What course shall we take to get from Constantinople to Batoum? The game was played by crew and passengers on the bridge of the ship and, unlike the prevailing custom in B.B.C. games, no one knew the right answers. Dust, fire and fever were the trio that brooded over Baku at the turn of the century. The first he could not elude. From fires he had narrow escapes in that crowded 27 acres, Bibi Eibat, the Russian oil El Dorado, where oil-soaked wooden derricks stood side by side and from time to time were consumed by flames. As in West Africa malaria again attacked him, but now there was a new treatment, injections of arsenic. This, painstakingly administered, left him worse, much worse, all but relegated to the tomb. But being doomed he was left alone. Injections stopped and he died of neither malaria nor arsenic poisoning. Another movement in this symphony of danger was the earthquake likely to be accompanied by fires generated by puffs of subterranean inflammable gas. In spite of brigandage, murders and political assassination, life seems to have been supportable until unions and strikes made their appearance in 1903. Then he moved from Russia "to terrors that he knew not of" and set up as a consultant in London.

The contrast between then and now was demonstrated on his first journey to Peru. Crossing the Isthmus of Panama in 1905 was perilous for yellow fever stalked abroad; hotels were bad and their hygiene worse. On other journeys he saw this change as the fringes of the growing canal were cleaned up into the "Zone" where tourists now may safely graze. But yellow fever persisted and bouts of bubonic plague for good measure occurred on the west coast of South America and on islands in the Caribbean. Besides the risk of disease the certainty of quarantine, involving tedious delays under conditions of extreme discomfort, hung like a black cloud over the traveller's head. The reviewer's preoccupation with the stories of the early days described in the book does not diminish the interest of the later ones nor of the parade of many figures who have played their part in oil business. Finally, homage is due to the author of this record for the high-grade note-keeping of events as they occurred under conditions more often foul than fair.

J. V. HARRISON

GENERAL

GEOGRAFISKE FARVEBILLEDER. By J. HUMLUM. *Copenhagen: Gyldendal*, 1960. 9 × 7 *inches; 92 pages; 209 illustrations*

The magic lantern of former days has experienced translation and transformation through the medium of the colour transparency and, as a result, the armchair

geographer revels in a new fireside experience. Through colour photography geography has entered into a new technical heritage. *Geografiske farvebilleder* is an experimental volume which draws its coloured illustrations principally from 3500 exposures made by Johannes Humlum between 1948–59. The book is compiled with the aid of Vilhelm and Arne Humlum (whose pedagogic backgrounds complement the academic background of Professor Humlum). The 200 photographs are presented systematically, with fifty illustrations of physical features followed by successive groups dealing with rural and urban economies, transport and settlement forms. Two-thirds of the illustrations are drawn from Asia and North America. Photographs and captions are neatly arranged but, because of the format, a number of illustrations are too small to make their full impact. The book at large demonstrates the significance of colour as a landscape feature and the loss suffered by its general omission. Professor Humlum and his collaborators believe that within the next decade coloured illustrations for school textbooks will be regarded as naturally as black-and-white illustrations are today. The *National Geographic Magazine* has pioneered coloured illustrations for a number of decades and the *Geographical Magazine* owes something of its success to a similar feature. Yet the geographical author who persuades a publisher to include coloured plates in his book is still something of a miracle man. Gyldendals Press proves that it can be done (and presumably economically) in Copenhagen. W. R. MEAD

HANDBOOK FOR GEOGRAPHY TEACHERS. By G. J. CONS and R. C. HONEYBONE. Prepared by the Standing Sub-committee in Geography, University of London, Institute of Education. 4th edition. *London: Methuen*, 1960. 7½×5 *inches; 525 pages. 22s 6d*

The new edition of this work, prepared by G. J. Cons, whose untimely death left the completion of the publication to a worthy successor in Mr. R. C. Honeybone, is even more of a boon to teachers of geography than its predecessors were, and should certainly form part of every teacher's library. The personnel of the Standing Sub-Committee in Geography which produced the book and the impressive list of contributors guaranteed its quality and usefulness. The sections on practical teaching and the syllabuses connected with them cannot fail to be of the utmost interest and use to young teachers. The bulk of the book is properly devoted to lists of texts which might be found useful in schools and which are placed in categories according to the requirements of primary, secondary and sixth form standards. Of this section there cannot be too much praise. Those readers, whatever their geographical standing may be, who are interested in this branch of learning, will find great interest in the section which includes lists of works of general literature whose pages give geographical descriptions and accounts of exploration and travel. Such a list should be of immense use to the keeper of a school geography library or geographical portion of a general school library. The list cannot, however, be said to be complete. One might say that it cannot be complete, for in this as in all literature individual taste must play a part. Poets, whose work include much geographical description, are almost wholly omitted, and it is surprising not to find such works as H. V. Morton's *In search of Scotland*, Hilaire Belloc's *The road*, Childers's *The riddle of the sands*, and J. B. Priestley's *English journey*. E. D. LABORDE

SHORTER NOTICE

ÖSTERLAND OCH VÄSTERLAND is the title of a paperback by the Swedish orientalist C. E. Svenning which gives a background to Unesco's "East-West Project" (*Lidingö: Internationella Bokklubben*, 1960, Sv.Kr. 6.50). A chapter by a member of the Swedish Unesco committee describes what western countries (including Russia) are doing to rouse popular interest in Unesco ideals, and there are a number of illustrations selected by Ragnhild Norlin-Svenning, in addition to the main part of the book which describes, briefly and impartially, the religious and political movements throughout history in both East and West, and relates them to the physical geography of the cultural areas under review. C. M.-B.

CARTOGRAPHICAL PROGRESS

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

The First General Assembly of the International Cartographic Association was held in Paris from 29 May to 3 June 1961. Thirteen founder nations were represented, and twelve other nations were elected to membership during the Assembly. Great Britain was represented by Brigadier L. J. Harris, Vice-President, Brigadier D. E. O. Thackwell, principal delegate, and four other delegates. The statutes for the Association were approved, and a new executive committee was elected to serve until the next general assembly in 1964. Professor Imhoff of Switzerland was re-elected President of the Association and, among the Vice-Presidents, Brigadier D. E. O. Thackwell was elected in the place of Brigadier L. J. Harris, who retired. The Association is now affiliated to the International Geographical Union, and Prof. Carl Troll, President of the Union, was by invitation present throughout the meeting.

Approval was given to a Technical Conference to be held at Frankfurt in 1962, probably during September, and the Assembly formally accepted the invitation of the United Kingdom for the next General Assembly to be held in London in conjunction with the International Geographical Congress in 1964. Resolutions were passed asking for the assistance of UNESCO in facilitating the exchange of cartographical information and documents between nations, and recommending that each member of the Association should collaborate in the project of the International Map of the World, a conference on which is planned for 1962.

The Assembly was efficiently organized by the French Committee for Cartographic Techniques, and housed in the Centre de Conférences Internationales, Avenue Kléber. Visits to the Institut Géographique National and to the Institut Français de Pétrole were arranged, and an International Exhibition of Cartography was very effectively displayed in the Bibliothèque Nationale. Hospitality to the delegates included a dinner at the Eiffel Tower and an evening visit to the Louvre.

A whole day visit to the Institut Géographique National at Saint-Mandé was arranged for the delegates. After a welcome by the Director, M. Rumeau, the delegates were taken in groups through the various departments. One problem in the drawing office is common to that of similar agencies; the young women who form the majority of the staff leave while still young. The I.G.N. have tackled this by continuing to employ them on a part-time basis in their own homes, and the special equipment designed for them—drawing-scribing table-tops, sets of scribing instruments, etc.—was displayed. This is an idea which might be worth following up. Examples of work on show were nearly all scribed on plastics, name positioning being done by staphograph.

The department dealing with material is exceptionally well equipped. It is possible to calibrate every instrument connected with field survey, air photography, photogrammetry, drawing and printing. There was even a special cabinet for testing paper at varying degrees of humidity and temperature—though the printing itself is done in former stables in the Rue de Grenelle. This building is wholly air conditioned.

In the department of geodesy, progress diagrams of triangulation, levelling, astro-fixing, etc. were shown. A great deal has been done of all three in the Sahara, also tellurometer distance measurements. It was, however, impossible to find out why astro-fixes 60 kilometres apart were then connected by tellurometer measurements. Equipment also includes electronic and electro-magnetic computing machines.

A room (again on the small side) in the photogrammetric section was full of stereoplotting instruments, and it was stated that the I.G.N. has no less than 120 of these instruments in use. The sixth department is known as the École Nationale des Sciences Géographiques et Documentation Technique, and is responsible for the technical training courses and for the archives.

After lunch in the canteen, the party went by coach to the Rue de Grenelle to see the map reproduction and printing establishment. These old buildings offer a great contrast to the new ones at Saint-Mandé, having been converted from their former use as a school of equitation. Again the equipment was lavish and most of it modern.

It was a most interesting day, but many of the visitors would have preferred more time in fewer departments, to discuss methods and exchange ideas.

A most instructive cartographic exhibition was mounted in the Bibliothèque Nationale. Its theme was "The cartographic representation of relief". In organizing the exhibition the Comité Français des Techniques Cartographiques had received much assistance from the Département des Cartes et Plans of the Bibliothèque Nationale (Mlle M. Foncin and M. Froelich) and the Map Library of the Institut Géographique National. A useful annotated catalogue was also available. The exhibition was of added interest to geographers as it was sub-divided according to the topographical features represented: ancient massifs, glaciated regions, folded mountains, volcanic areas, and similar features, and maps of the same areas on various scales were related to each other, and in some instances to air photographs. Among the map publishing agencies which exhibited notable maps were the Institut Géographique National, Paris; the U.S. Geological Survey; the Federal Topographical Service of Switzerland; the Ordnance Survey and the Directorate of Overseas Surveys, United Kingdom; the Ministry of Mines and Topographical Surveys, Canada; the Royal Australian Survey Corps and the survey departments of several German States.

The exhibition brought out very clearly the general direction in which the design and style of topographic maps are proceeding. A number of the larger series still employ contours, with or without hillshading, and rock work. The use of hypsometrical colouring, with significant changes, however, is gaining ground. The tendency is to avoid the old "stepped" appearance, due to the use of often sharply contrasted tints, sharply marked off from each other by heavy contour lines. The tints, more restricted in number and range of colour, blend almost imperceptibly into each other, thus avoiding abrupt changes, and are reinforced by hillshading. Contours are sometimes put in, including some intermediary to the changes in tint. The old conventional range of hypsometrical tints, from green through buff to increasing densities of brown, is also being abandoned. One map employed effectively darker and heavier tints for the lower ground and lighter for the higher. These techniques can often be effectively combined with hillshading. It was also apparent that a more restrained use of colour is general, to avoid too great a weight of colour over the map as a whole. The recent German sheets show that this has been appreciated. In some instances great ranges of colour were used, necessitating as many as twelve printings. This, of course, makes production very expensive, and the exhibits, e.g. of the Directorate of Overseas Surveys, showed what can be done with less ambitious schemes involving about six printings. Some effective use was also made of land form symbols on some maps, on the lines evolved by Erwin Raisz, but such methods still tend to produce rather a diagrammatic effect. It was also made clear that maps require to be designed more closely to deal with the particular type of country covered. If the area is closely contoured, the contour lines themselves will naturally bring out features such as escarpments, volcanic craters, etc., but other features also help; e.g., where dip-slopes are closely wooded, the solid green of wooded areas almost achieve the effect of hillshading, as could be seen on some Swiss sheets.

SOME RECENT ATLASES

The Reader's Digest Association have published a *Great World Atlas* which has some interesting features. It consists of three sections, "The face of the world", eleven maps on the orthographic projection of the continents and larger regions; "The countries of the world", forty-seven reference maps by George Philip Ltd.; and "The world as we know it", a section of topical maps, diagrams and illustrations in colour. The orthographic maps, by the use of colour and hillshading, indicate "what a country is like on the ground", i.e., the distribution of ice caps, tundra, coniferous forest and so

forth. Cultivated or arable land is not differentiated. The reference maps show relief by subdued hypsometrical tints. This produces a pronounced "layered" effect, but tends to smooth out the more mountainous areas. The third section has a number of physical, distribution and historical maps, including such topics as "Frontiers of civilization", the "Great explorations" and "What the world is eating". There are one or two omissions of exploring routes, and the text on physical geography makes no reference to land forms or development of soils. It is also an error to state that the orthographic maps show the earth as seen from a distance of 10 miles, since the maps are on various scales. The index contains about 25,000 entries.

The *Historical Atlas of Canada*, edited by Professor D. G. G. Kerr, under the authority of the Canadian Historical Association, sets a new standard for historical atlases. Due attention is given to the physical environment, and the routes of explorers and the advance of settlement are closely related to it. Part Four, "Founding a nation, 1867–1914", and the final section, "Main economic and political trends since 1867", are particularly illuminating. Throughout, the history of Canada is seen, not solely in relation to the North American continent, but also to the outer world and the great movements of Western civilization. A variety of techniques have been used in making the maps, and all detail restricted to the particular purpose in hand. On the topographic maps, relief is effectively shown by a single mauve-grey tint with hillshading, but a few spot heights might have been added with advantage. On the topical maps the relevant detail is over-printed in red or green. The economic section is supplemented by graphs and diagrams. A useful feature also are the early maps reproduced in the historical section, including Champlain's map of 1632. Geographers would have welcomed general climatic and vegetation maps (though these are provided for the Prairie region).

Nelson's Canadian Atlas, edited by Professor J. Wreford Watson, is an entirely new, well designed and printed school atlas. On the general maps the content has been confined to significant detail only, with four important constituents of modern industrial power emphasized (oil, iron, coal and hydro-electric power), with little attention given to relief. On the relief maps included, it is shown in the now popular method of blended layer tints and hillshading. In the section covering land forms and cultural regions, photographs, maps and diagrams are closely related. The explanatory plate on the representation of relief is not particularly helpful, and in the text on land forms no account seems to be taken of temperature changes or chemical erosion.

One of the best American general atlases, Goode's School Atlas, has appeared in its eleventh edition as *Goode's World Atlas*, edited by E. B. Espenshade, Jr. The maps are clearly printed and the emphasis on the various features well balanced. A combination of layer tints, with the contour lines drawn in, and hillshading, produces an effective background for the general maps, which are clearly lettered. The distribution maps, covering a wide range of resources, employ the dot technique. As regards names, a reasonable compromise is achieved by using local official names for settlements and for local topographic and water features—Lisboa, Livorno, Warszawa without qualification—though this is not strictly true for what has been done with non-Roman alphabets. Events have also overtaken the cartographer of the map of Africa.

Goode's World Atlas. 11th ed. Ed. E. B. Espenshade, Jr. Chicago: Rand McNally, 1960. $11\frac{1}{2} \times 10$ *ins.* xii+288 *pages* (*including* 168 *pages of plates*). 70*s*

Historical Atlas of Canada. Ed. by D. G. G. Kerr. Toronto: Thomas Nelson (1960). $11\frac{1}{4} \times 9\frac{1}{4}$ *inches.* x+120 *pages, including* 153 *maps and diagrams.* $5.00

Nelson's Canadian Atlas, 2nd ed. Ed. by J. Wreford Watson. Toronto: Thomas Nelson, 1960. $11\frac{1}{4} \times 8\frac{3}{4}$ *inches;* 92 *pages.* 30*s*

Great World Atlas. London: The Reader's Digest Association. (1961). $16 \times 10\frac{3}{4}$ *inches;* 177 *pages*

G. R. CRONE

NATIONAL SUB-COMMITTEE FOR CARTOGRAPHY

To meet increasing developments and activities in cartography, the Council of the Royal Society approved in December 1960 the formation of a Sub-Committee for Cartography, which could devote itself entirely to cartographical matters, previously discussed by the National Committee for Geography. The Chairman is Brigadier

L. J. Harris, Ordnance Survey, and the sub-committee consists of representatives of official map-producing agencies, of government bodies and societies interested in the production, use and conservation of maps, and of university geography departments. Cartography has been interpreted broadly, as covering the assessment and selection of source material, design, compilation and fair drawing and the reproduction and publication of maps, but it is recognized that full study of the subject must be related to geodesy, photogrammetry, geography, geology and printing technology. The purpose of the sub-committee is to advise the National Committee for Geography on all cartographic matters, particularly to assist in the formulation of a British point of view in international proceedings, to encourage the exchange of ideas and experiences, and to advance cartographic knowledge in this country.

The sub-committee has noted that both the Royal Geographical Society and the Royal Scottish Geographical Society publish cartographic articles in their journals and hope that these will continue as a normal feature. The Land Survey Division of the Royal Institution of Chartered Surveyors has recently included a cartographic lecture in its winter programme, a development which it is hoped will continue. The Ordnance Survey has also accepted the suggestion of the sub-committee to hold a Technical Symposium in November next for about 40–50 invited persons, and it is expected that the experience of this symposium will lead to similar symposia at regular intervals.

These are encouraging beginnings but ultimately the achievement of these aims, and possibly their further development, will depend on the strength, energy and enterprise of the body of British cartographers as a whole. The sub-committee is representative of the major governmental, academic and private organizations concerned with cartography, and their cartographers can be readily listed. But it is realized that there are many experienced cartographers outside these organizations. The sub-committee is interested in compiling a list of cartographers of experience who are engaged, or have been engaged, in the compilation and production of maps, in research in cartography, or in the teaching of cartography, and who would be able to join actively and responsibly in scientific discussions on the subject. It is hoped, too, that many would be able to contribute technical papers or to give lectures on the subject. It is felt that the list should include also those persons of a similar capacity in allied subjects, e.g. geodesy, photogrammetry, geography, geology and printing technology when applied to cartography. A knowledge of those engaged in promoting British cartography will be a guide to the scope of possible activities in the future. Anyone outside these organizations possessing the necessary qualifications or attributes is invited to send his or her name to the Chairman of the British National Sub-Committee for Cartography, c/o The Royal Society, Burlington House, London W.1. It would be convenient for filing if the following information was typed on one side of a standard postcard (size $5\frac{3}{4} \times 3\frac{3}{4}$ inches):—name: title: age: academic, professional qualifications or membership of learned society: present organization: post held or capacity in which employed: aspect of cartography in which interested.

INTERNATIONAL CARTOGRAPHY: SOME COMPARISONS

The exhibition of "Relief in Cartography" held in Paris in connection with the meeting of the International Cartographic Association, left no doubt on three counts: first, about the importance with which cartography now regards itself; second, of that explosive quality "amour propre cartographique"; and third, of the very large sums of money that the subject now involves. International exhibitions of this kind should become occasions for taking stock—with proper humility and constructive criticism. How successful have contemporary cartographers been in expressing relief?

The majority of maps in this exhibition were topographical; as such they were—or should have been—concerned to present *all* aspects of the selected rectangle of country, not relief alone. The selection naturally concentrated on maps of regions with spectacular relief, and one tended, consequently, to appreciate the region rather than the method of mapping it. The Swiss, for example, had not offered maps of some of their more gently rolling, duller country to substantiate their cartographic self-confi-

dence. But the Swiss Topographical Survey's *Préalpes de Glaris* at 1:25,000 in eight colours with contours at 20 m. intervals seemed to me perfection of its type, with hill-shading—*estompage*, as the French call it—in that stereoscopic yet translucent grey that made both peaks and valleys sing. And the three-dimensional effect was matched by a black plate (names, houses, roads, boundaries, etc.) of a piercing crispness that enables a hair line to have its significance. Their map of Mount McKinley showed how they can apply these techniques to other than Swiss mountains. I can give no higher praise to French alpine cartography than to say that it was often almost indistinguishable from Swiss.

The British exhibits were representative of the new look in our map-making. The "break-through" to hillshading in school atlases, in the new 1-inch Tourist editions, and in some effective War Office and Overseas Surveys maps is a most encouraging indication of the intellectual and technical efforts that have gone into British cartography over the last five years. Probably none of us would quite claim perfection—yet—but at least there are good grounds for hoping that British maps at an equivalent international exhibition in 1964 will be among the best.

Since the general methods of showing relief do not greatly differ internationally, and since almost every modern map is produced by lithography, there is, in an exhibition of this kind, a sense of visual sameness, with few exhibits startlingly different. But by contrast, a visit to the Musée de l'Art Moderne and, in particular, to the 1960 Prix Marzotto exhibition of contemporary European painting, emphasized the narrowness of the colour range used in modern cartography. Our colour limitations are excused by the necessity to produce maps in quantity and not as a series of originals. But many cartographers count aesthetics as desirable, so perhaps some attention should be given to the wide range and to the depth of colour used, for example, by such a painter as Corrado Cagli, whose abstract "Concaves et convexes" really deals with a three-dimensional problem by hillshading—but of great richness.

Below any superficial appearance of "sameness" in the exhibition there were obviously many fascinating and technically interesting maps. The U.S. air chart of a part of the Moon at 1:1M. was interesting in itself and set out its source notes and explanation with clarity. The Israeli 1:250,000 map of "Palestine" experimented with hillshading and a new range of layer colours (ending up in yellows for high ground) to sidestep the old ambiguity about dark green as a layer colour in arid areas; but used fifteen colours in the process. The Dutch topographical maps reminded one that in flat areas "relief" can best be presented by many spot heights and a clear water pattern. The effective French 1:25,000 of the Gironde estuary was assiduous in its portrayal of the details of the channels and dykes and the whole involved water pattern. The French *Relief Form Atlas* was as effective an illustration of relief cartography as of the geomorphology that its examples dealt with, by air photographs, anaglyphs and maps. The Japanese Hydrographic Office showed an interesting map of the North-west Pacific with each contour in black on north-west (upward) slopes and white on south-east slopes: hillshading was effectively achieved by this and by a similar U.S. Hydrographic chart of the Straits of Gibraltar. An annexe of "old" maps ranged from the fourteenth to the nineteenth century, and from hills-in-profile to hachures; they showed an enviable technical simplicity that we need to try to regain, as well as having a sense of *décor* in their margins and legends.

The absence of the vast Russian maps that covered so much wall space at the 1960 I.G.U. exhibition in Stockholm also deprived us of the nostalgia of seeing in those thick green and brown layers a style of relief cartography uninfluenced by the trends to which we in the West have been giving so much attention lately. Is this unconscious Russian conservatism, or is it a conscious refusal to divert resources to developing new *styles* of mapping when there is so much straightforward new mapping to be done?

While a map must stand or fall by its effectiveness and, like a picture, should not be judged by the techniques of its production, there is nevertheless much interest in the techniques of hillshading. Broadly, there are two methods of obtaining this stereoscopic effect, which assumes (generally) a north-west light: (*a*) by drawing or painting

shadows, interpolating them from the contours, and (*b*) by constructing a three-dimensional model of the area, illuminating it and photographing the shadows.

In spite of a severe Swiss doctrine in favour of method (*a*), it is in practice difficult to distinguish between the final results, particularly since method (*b*) can be supplemented by hand work. Method (*a*) may perhaps show advantages in spectacular mountain country and at large scales. The photographic method is probably more subtle and effective in gentler or rolling country, large bits of which will inevitably be involved on smaller-scale maps. The methods used at any cartographic institution are, in practice, conditioned by its existing production set-up; probably this is inevitable.

In most instances hillshading is printed in a separate colour or colours of its own and is concerned only with angle of slope and not with absolute altitude (which is dealt with by contours or layers). Attempts have been made to express both slope and altitude by hillshading, so as to leave other colours free to show vegetation; but obvious ambiguities arise, and a mass of spot heights become necessary (though too often absent). The colour in which the shadow tints are printed can be a source of difficulty—if too light, the map looks flat; if too dark, names in the shadows are illegible; and the grey in the flat areas, from which light or dark slopes arise, must not give the map an over-all muddy look. But the Impressionists did not stick to grey for shadows!

From an international exhibition showing how millions of pounds have been spent in recent attempts to show relief, one ought, surely, to be able to see signs of the future. Is this a field of lively experiment, or are we cartographers so exhausted by the sheer complications of our present techniques of map-making that we have no energies for experiment? Have we perhaps been so impressed by our new *technical* advances in the means of map production that we have rather forgotten the end—the finished map? Is a combination of hillshading, layers and contours what topographical maps will be like for the next century? There are some signs of new ideas, and one hopes that there may be curiosity and funds enough to back these, and—formidable thought—inject life enough to question the alpine ideal!

Coloured air photographs and anaglyphs have been known for long: they have some startling advantages and disadvantages—but have they "growth" possibilities for small- and medium-scale cartography in an "air age"? Other relief experiments attempt to show angle (as opposed to shape) of slope (e.g. the plate displayed from the *Atlas of Sweden*)—full circle from the hachures on the old French 1:80,000 maps. Structure or physiographic mapping seems also to offer some possibilities, at least for sophisticated audiences, in its attempt to demonstrate the geology that "holds the relief up"; there were some interesting experiments at the exhibition by Bertu and Birot (from the Laboratoire de Cartographie de l'École Pratique des Hautes Études—note that there is *no* English equivalent). One of these maps was mounted on glass and illuminated effectively from behind—but only in one colour. And there seem great possibilities in plastic relief mapping—the building of a three-dimensional model and the vacuum forming of a map printed on plastic over the top of the model. At present these plastic relief maps are not much more than an expensive (and not always accurate) way of showing no more, no better, than what is shown by equivalent flat maps with hillshading (cf. the plastic relief and the paper versions of the I.G.N. maps of Martinique 1:100,000; at first glance it is the—cheaper—paper one that stands up). But plastic does offer the opportunity of showing the third dimension as "a part of the paper", releasing all the colours of the paint box for uninhibited representation of what covers the land, what the soil is, or whatever other combination of information may be geographically significant to a particular or general map user. Moreover, plastic can perhaps also offer a new and brighter medium for colours than lithographic inks and paper.

Cartography has become international, and one can look forward to more exhibitions of this kind. One illuminating addition would be for catalogues to give a measure of the *effort* involved in the making of each map (most usefully in terms of the cost of man-hours plus materials); another would be to devote a part of the exhibition—even perhaps a cartographic Prix Marzotto—to maps illustrating new ideas in cartography, and not solely to new techniques.

D. P. BICKMORE

THE SOCIETY'S NEWS

NEW MEMBERS OF COUNCIL

At the Annual General Meeting of the Society on 19 June 1961 Sir Raymond Priestley, M.C., Vice-President and a Gold Medallist of the Society, was elected President in succession to the Rt. Hon. Lord Nathan. Sir Raymond Priestley, who served with both Scott and Shackleton in the Antarctic, is a former Vice-Chancellor of Melbourne and Birmingham Universities, and Director of the Falkland Islands Dependencies Scientific Bureau from 1955–9. He is also a past President of the British Association for the Advancement of Science. Lord Nathan, Sir Vivian Fuchs and Sir John Hunt become Vice-Presidents and Sir Christopher Summerhayes becomes Honorary Secretary in place of Dr. Edward Hindle. Of the seven new Members of Council, six will serve for the first time: namely Dr. G. C. L. Bertram, Lt.-Colonel G. J. Humphries, Mr. G. E. Hutchings, Miss G. M. Rhodes, The Rt. Hon. Lord Shackleton and Mr. Michael Westmacott. Colonel Andrew Croft served on the Council from 1949–52.

Dr. G. C. L. Bertram, Fellow of St. John's College, Cambridge, is a former Director of the Scott Polar Research Institute, Cambridge; he was awarded the Murchison Grant in 1957. Lt.-Colonel G. J. Humphries is Deputy Director, Overseas Surveys. Mr. G. E. Hutchings is President of the Geographical Association, and Senior Tutor in Geography, Field Studies Council. Miss G. M. Rhodes is a niece of the late Cecil Rhodes.

The Rt. Hon. Lord Shackleton is a former Parliamentary Private Secretary to the Minister of Supply and to the Foreign Secretary; he was awarded the Cuthbert Peek Grant in 1934 for Arctic exploration. Mr Michael Westmacott, a statistician, was a member of the successful Everest Expedition 1953.

General Sir James Marshall-Cornwall (Past President), The Lord Bishop of Norwich and Dr. Edward Hindle were designated Honorary Vice-Presidents.

LADY DOROTHY MILLS AWARD

As a result of a bequest of the late Lady Dorothy Mills, Fellow of the Society, an award has been established of £1000 to be made to a young woman traveller who is also a Fellow of the Royal Geographical Society. The award will be made in the form of a grant covering one or more years and will be primarily for a project involving travel of an adventurous kind rather than projects purely for academic research. Applications should be made on the prescribed form, which may be obtained from the Director and Secretary of the Royal Geographical Society. Applications for 1962 should reach the Society not later than February 12.

APPLICATION FOR GRANTS FOR EXPLORATION AND RESEARCH 1962

Applications for grants for both exploration and research must reach the Director and Secretary not later than 12 February 1962; it is only in very exceptional circumstances that later applications can be considered. Applications must be **typed** on the Society's own form which can be obtained on request; they must be accompanied by evidence of support from institutions or qualified individuals supporting the proposed expedition or research. Leaders of expeditions and other applicants for grants may be expected to attend an interviewing board.

The Society is now prepared to consider applications for support from expeditions of less than undergraduate status (i.e. school-boys and young people from industry and commerce).

EDUCATIONAL CORPORATE MEMBERSHIP

At a Special General Meeting on 19 June 1961 a new category of membership was instituted for the benefit of schools, colleges and educational establishments generally. Full details may be found in the Meetings Section of this *Journal*, on pp. 388–9.

UNIVERSITY ESSAY PRIZE 1960

The Council of the Society, on the recommendation of the Education Committee, has awarded the University Geographical Essay Prize for 1960 to Philip K. Boden, Fitzwilliam House, Cambridge, for his essay "The limestone quarrying industry of North Derbyshire". The number and quality of the essays submitted showed a considerable advance on recent years, and the examiners also commended the following: M. K. Kirby, Trinity College, Cambridge, "A drainage basin in La Palma"; N. F. Large, St. John's College, Cambridge, "The Stroud valley and its superficial deposits"; N. R. Shave, Southampton University, "A study of the geomorphology of the Vale of Arreton in the Isle of Wight"; and Derek Thompson, Manchester University, "Changing patterns of settlement in the largest civil parish in England and Wales".

Conditions for 1961.—The Council of the Royal Geographical Society offer an Annual Prize of £10 for the best geographical essay not exceeding 5000 words in length, including sketch-maps and diagrams, written by a student reading geography at a university in Great Britain or Northern Ireland. Essays must be submitted before the end of the calendar year in which the student took his final examination. The closing date for 1961 is therefore 31 December 1961, and essays should be addressed to The Director and Secretary, Royal Geographical Society, Kensington Gore, London, S.W.7. *Attention is particularly drawn to the condition regarding length.* The Council reserves the right to publish or retain for the Library any of the essays submitted.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

Professor D. B. Quinn is Professor of Modern History in the University of Liverpool. *J. R. James, Sheila F. Scott* and *F. C. Willatts* are all members of the staff of the Ministry of Housing and Local Government. *Major H. W. Tilman*, a member of the Everest expedition of 1935 and leader in 1938, was awarded the Founder's Medal of the Society in 1952; he went to Patagonia in his yacht *Mischief* in 1955 and explored the ice cap. *Miss Ann Savours* is assistant librarian and curator of manuscripts at the Scott Polar Research Institute, Cambridge. *G. R. Tibbetts* has been librarian of the Oriental Institute, Oxford University, since 1960, and was formerly deputy librarian of the University of Khartoum. *R. L. Cloet* is on the staff of the Hydrographic Department of the Admiralty. *Edward Derbyshire* is a lecturer in geography, Newcastle University College, University of New South Wales, and was formerly research assistant, McGill Subarctic Research Laboratory, Knob Lake, Quebec.

UNIVERSITY NEWS

University of London: London School of Economics

Dr. Emrys Jones, who succeeds Professor R. O. Buchanan in the Chair of Geography at the London School of Economics, received the whole of his undergraduate and graduate training at the University College of Wales, Aberystwyth. He began his professional career at University College London soon after the Second World War, continued it at The Queen's University, Belfast, where he became a senior lecturer, and returned to London in 1959 to the newly established Readership in Social Geography at the London School of Economics. The title of that Readership indicates his major field of interest.

LEVERHULME RESEARCH AWARDS

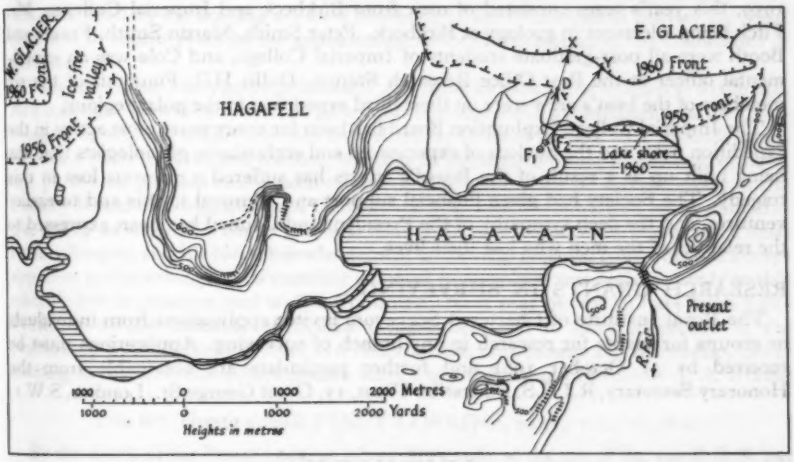
The trustees of the Leverhulme Research Awards recently announced a number of fellowships and research grants tenable for periods up to two years. Among them was a fellowship awarded to Peter Haggett, university demonstrator in geography, Cam-

bridge University, for the study of secular changes in the forested area of the Serra do Mar, Brazil, 1814–1962. It will be remembered that Mr. Haggett lectured to the Society on 18 January 1960 on his work in the Serra do Mar (*Geogr. J.* 127 (1961) 50–62).

Also announced are research grants to E. G. Bowen, Professor of Geography and Anthropology, University College of Wales, for the study of the historical geography of the early Christian period in Celtic Europe; and to M. H. Ballance, librarian at the British School at Rome, for a survey of Roman roads and settlements in western Cappadocia, for the International Map of the Roman Empire on the 1:1M. scale.

FURTHER RECESSION OF AN ICELANDIC GLACIER

Quantitative information about the retreat of the East Hagafell glacier of Langjökull was provided (Hannell and Ashwell, 1959) as one result of the 1956 expedition of the British Schools Exploring Society. Mean annual recessions of 70 m. for the period 1934–56, and 83 m. for the period 1950–56 were noted. The Society's 1960 expedition carried out a further survey of this glacier in September, using plane-tables, and plotting onto the 1956 map. Extreme difficulty was experienced in finding the actual ice margin in the thick mass of black clay and dead ice which now covers the entire snout of the glacier, and for this reason an accuracy of only ±25 m. is claimed.



In 1950 the Durham University Exploration Society (Durham Univ. Expl. Rpt.) left a cairn, F_1, which was 102·7 m. from the ice edge, measured through a directional cairn F_2. In 1956 the distance from F_1 to the ice edge was 600 m., but it should be noticed that in this instance the measurement was made along a line indicated by F_1D on the accompanying map, because the line through F_2 did not then reach the ice edge at right angles.

In 1960 the distance between F_1 and the ice edge along the line F_1F_2Y was 970 m. The total recession over the period 1950–60 is therefore 867·3 m., or an average annual recession of 86·7 m. Measurement taken from the map shows that the distance along the 1956 line F_1DX would be almost identical. It appears, therefore, that the East Hagafell glacier has continued to recede at about the same rate as before. Part of the West Hagafell glacier was also examined, and further considerable recession was found to have occurred, both on the front, and along the south-west facing slope of Hagafell.

As a result of the recession of the East glacier it is now clear that Hagavatn is no longer an ice-dammed lake. Its shape should remain constant in future unless either

the glacier begins to advance again, or downcutting in the soft palagonite rocks forming the waterfall at the present outlet proceeds very fast.

P. B. WHITESTONE AND I. Y. ASHWELL

References

Hannell, F. G. and I. Y. Ashwell 1959 The recession of an Icelandic glacier, *Geogr. J.* 125, 84–88.

Durham University Exploration Society *Report on 1950 Expedition to Hagavatn (Iceland)*. Unpublished.

UNIVERSITY OF LONDON BEERENBERG EXPEDITION

The death occurred at the end of June of five members of the University of London Beerenberg Expedition, led by F. J. Fitch. Six members of the expedition were travelling by boat from the Radio Station to Cross Bay on the north-west coast of Jan Mayen Island, when a violent and sudden storm capsized their boat and only Mr. Fitch managed to survive the hundred yards swim to the shore. It is thought that the other five succumbed to the cold, which might well have been as low as 28° F. Those who were lost were Peter Smith (deputy leader), Cyril Martin Smith, John Frederick Cole, John Robertson Fraser and John David Booth. The general object of this year's expedition to Jan Mayen was to make a detailed geological and glaciological study of the Beerenberg and surrounding glaciers in north Jan Mayen Island. As in 1959, this year's team consisted of men from Birkbeck and Imperial Colleges, Mr. Fitch being a lecturer in geology at Birkbeck. Peter Smith, Martin Smith, Fraser and Booth were all post-graduate students of Imperial College, and Cole was an experimental officer at the Post Office Research Station, Dollis Hill. Four out of the six members of the boat's crew were on their third expedition to the polar regions.

The Imperial College Exploration Board has been for many years most active in the expedition field, and the nucleus of experienced and enthusiastic glaciologists that was being built up as a result of the Board's efforts has suffered a grievous loss in this tragedy. The Society had given financial support and approval to this and to earlier ventures, and the deep sympathy of the President and Council has been expressed to the relatives of the men who lost their lives.

RESEARCH GRANTS IN SURVEYING

The Royal Institute of Chartered Surveyors invites applications from individuals or groups for grants for research in any branch of surveying. Applications must be received by 31 October 1961 and further particulars are obtainable from the Honorary Secretary, R.I.C.S. Education Trust, 13, Great George St., London, S.W.1.

OBITUARY

WILLIAM VAUGHAN LEWIS

William Vaughan Lewis, who was killed in a motor accident at de Witt, Iowa, on 8 June 1961, joined the Society as a Life Fellow in 1930. He gave several addresses to the Society and edited the fourth volume of the Research Memoirs. He travelled in Iceland, Scandinavia and western Europe, and since April of this year he had been in the United States. There he had already given some lectures, and was, at the time of his death, *en route* to Kansas to do some field-work. He hoped later to visit Canada and Alaska. His earlier contributions to coastal physiography and glaciology were recognized by the Society, in 1939, by the award of the Cuthbert Peek Grant.

Vaughan Lewis was born at Pontypridd in 1907 and was educated at the County School in that town. In 1926 he went up to Gonville and Caius College, Cambridge, and in his first year read part one of the Mathematical Tripos. His heart, however, was in geography and he proceeded to take the two parts of the Tripos, as it was in those days, in 1928 and 1929. In part two he specialized in geomorphology and surveying.

The following October Professor Debenham asked him to act as a student demonstrator, a post he held until he was appointed a university demonstrator in succession to Mrs. Anderson (Miss Margaret Willis) in 1933. In the ordinary course he would have probably been appointed to a university lectureship in or before 1940, but because of the war, and the "freezing" of university appointments, he was not promoted to a lectureship until 1945. In 1949 he was elected to a Fellowship of Trinity College, an appointment which afforded him very great pleasure. In his turn he gave the College—as to all other institutions to which he belonged—loyal and unstinting support and served for a period on the College Council and for some time as a Tutor.

In geography he made a distinguished contribution. His early work, following visits to the Norfolk coast, was concerned mainly with coastal physiography. Later he did some extensive research on Dungeness and Chesil Beach—much of the latter is still unpublished. He also wrote on the orientation of beaches. A visit to Iceland in 1936 turned his interests and activities more and more to glaciology, in which subject he initiated work on the flow and structure of glaciers. This he carried out in Switzerland and Norway. The work necessitated a good deal of help which was willingly and regularly given by generations of students from the department of geography. Of greater significance, however, was his appreciation of the necessity of interesting experts in other branches of science in glaciology, and it is to his lasting credit that he induced physicists to work in the field with him. His researches in glaciology were acknowledged by his holding a Vice-Presidency of the Glaciological Society for some time and in recent years by his appointment to the chairmanship of the Committee of that Society.

Vaughan Lewis was a great enthusiast. Anything he took up he worked at to the full. As a colleague he was excellent; he gave of his best and made a contribution to the Cambridge Department which can only be realized by those of us who were his colleagues. He was a born lecturer and teacher, whether in the lecture room, laboratory, or field, and passed on his own enthusiasm to others. For some years he was Secretary of the Faculty Board of Geography and Geology—a post which emphasized his administrative ability as well as his happy personal relationships. He was a true friend and a most loyal colleague, and his full acknowledgement of the help received from others is always apparent in his writings. His standing amongst geographers was high, not only in this country but in America and on the Continent. Next year he was to have been Vice-President of the Institute of British Geographers and to have succeeded to the Presidency in the following year. His cheerfulness, enthusiasm and friendship, to say nothing of his academic achievements, leave a gap that cannot be filled. J. A. STEERS

THE RT. HONBLE. SIR PERCY LORAINE, BART., P.C., G.C.M.G.

By the death of Sir Percy Loraine, on 23 May 1961 at the age of 80, the R.G.S. has lost a very distinguished Fellow. From Eton he went up to New College, Oxford, in 1899, but on the outbreak of the South African War he joined the Imperial Yeomanry and served in S. Africa until the end of the campaign. Loraine entered the Diplomatic Service in 1904 and served in Turkey, Persia, Rome, Peking and Paris. In 1916 he was posted to Madrid as First Secretary and Head of the Chancery. In 1917 he succeeded his father as 12th Baronet and in 1921 became Minister at Teheran, where he served five years, being then transferred to Athens and in 1929 to Cairo, where he had the difficult task of succeeding Lord Lloyd. In 1933 Loraine was posted as Ambassador to Ankara, where he achieved outstanding success and won the esteem and intimate friendship of Kemal Atatürk. After six years in Turkey, Loraine was transferred as Ambassador to Rome on the eve of the Second World War, but too late to influence the minds of Mussolini and Ciano. Loraine retired from the Foreign Service in 1940 and became a prominent and successful owner of race horses. In 1940 his horse Darius ran third in the Derby.

Sir Percy was elected F.R.G.S. in 1924 and gave a most interesting lecture to the Society in 1943 on "Perspectives of the Near East", a subject on which his knowledge was unrivalled. He served on our Council from 1943–45. J. H. MARSHALL-CORNWALL

MEETINGS: SESSION 1960–61

Meeting of 10 April 1961. The President in the Chair

Elections to Fellowship: Felipe Bezara; Captain G. H. Edwards; Bernard G. Ellis; Mrs. Enid L. Golding; John C. Goodridge; Frank B. Horne; George D. Watson; Rev. Raymond Webb

Paper: Voyage to Îles Crozet and Kerguelen. By H. W. Tilman

Meeting of 17 April 1961. Sir Miles Clifford in the Chair

Elections to Fellowship: Miss F. Barbour; James B. Franklin; Ian Graham; Anthony M. Homersham; Simon Hosking, B.A.; Nazar Mustafa, B.A.; Au Kam Nin, B.A.; John A. Paterson, B.A.; John M. Pritchard; John G. Sharps, M.A.; William H. Smith; R. D. N. Tamblyn, B.A.; Colin W. Walledge; Miss N. J. Watson, M.A.; George R. Wilkinson

Elections to Associate Membership: George S. Hood; Miss Susan G. Kaulback; Ian F. Weare

Film: "Festival in Kano" and "Surf boats at Accra". By Douglas Botting

Meeting of 24 April 1961. Admiral E. G. Irving in the Chair

Paper: Coastal cliffs. By Professor J. A. Steers and others

Meeting of 1 May 1961. The President in the Chair

Paper: The conquest of Annapurna II. By Captain R. H. Grant, M.C., R.M.

Meeting of 15 May 1961. Sir Vivian Fuchs in the Chair

Film: Falkland Islands Dependencies Survey. Introduction and commentary by Sir Vivian Fuchs

Meeting of 29 May 1961. The President in the Chair

Elections to Fellowship: T. A. F. Afolayan, B.A.; T. N. K. Allan; Dr. N. N. Ambraseys; R. L. Avasthi; I. H. Bradley; M. H. P. Baker; D. K. Baynton; Flt. Lt. I. P. Brotherton; A. N. A. Cader; S. Champatong; Michael J. Clay; Mrs. N. K. Clougher; Robert M. Cox; Miss A. M. Douglas; G. D. Edwards; D. A. A. Elliott; Charles P. Godhart; C. J. Guise; R. A. Hicks, B.SC.; Peter D. J. Holland; N. H. Jignasu; Gavin Kane; Kenneth Laughton; Rev. C. S. Lovett; J. A. Lyne; S. B. McCann; R. M. L. Mason; J. R. Mayo; B. Mellor, B.A.; W. N. Meredith; R. H. Morgan; G. Newton, M.B.; C. C. Parsons; Wilfred J. Riding; Miss A. M. Savours; V. H. Seymer; J. A. Seymour; Rev. H. John Vanderbeck; R. D. Vasey; Dr. L. E. Virone; F. H. Garvey-Williams

Elections to Associate Membership: Miss G. E. Dingle; Miss J. M. Kirkby; Miss S. J. Lewis; Miss S. J. Meldrum; Miss R. M. D. Smith; Malcolm Thorp; A. M. R. Turner; P. E. Waite

Paper: Travels in Madagascar. By David Attenborough

SPECIAL GENERAL MEETING, 19 June 1961. The President, the Rt. Hon. Lord NATHAN in the Chair.

At a Special General Meeting, held on 19 June 1961, with 101 Fellows present, the following amendments to the Bye-Laws (as last amended 13 June 1960) were unanimously approved:—

Chapter III. Election and Admission of Fellows and Members.

Add new Chapter as follows:—

Chapter III(d). Educational Corporate Membership.

1. There may be Educational Corporate Members of the Society who shall enjoy the rights and privileges specified in this Bye-Law.

2. The bodies eligible for Educational Corporate Membership (whether or not being in law bodies corporate) shall be any school, college or other educational establishment institution or organization which may from time to time be approved by the Council.
3. An Educational Corporate Member shall have the right (i) to send not more than six representatives to all ordinary meetings of the Society, (ii) to receive one copy of each issue of the *Geographical Journal*, and one copy of each issue of the *Geographical Magazine* and (iii) to use the general facilities and amenities of the Society upon such terms and conditions and in such manner and to such extent as may be prescribed by any regulations made by the Council which are for the time being current.
4. An Educational Corporate Member shall not have any right to vote, whether by itself or by representative, at any meeting of the Society and shall not be eligible to be elected to or represented on the Council of the Society.
5. Each Educational Corporate Member shall pay a subscription of at least £10 on admission for the current year and thereafter an annual subscription of at least £10, due on the 14th January in each year, without any right to compound for future subscriptions.
6. Subject to this Bye-Law the Council may make regulations from time to time concerning the procedure and conditions for admission of Educational Corporate Members, the circumstances in which a body shall cease to be an Educational Corporate Member and matters incidental thereto.

ANNUAL GENERAL MEETING, 19 June 1961. The President, the Rt. Hon. Lord NATHAN in the Chair.

The President opened the proceedings by welcoming, on behalf of the Council and Fellows of the Society, Her Royal Highness Princess Marina, Duchess of Kent, Honorary President of the Society. Her Royal Highness replied:

"Thank you, Lord Nathan, very much for your welcome to me. I am so glad to be here again at the Royal Geographical Society for one of our Annual Meetings, and I am touched that you should have expressed the good wishes of the Society to my son and daughter-in-law. You may be sure that I shall pass on your message and that it will be very warmly appreciated.

I consider it a privilege that you have once again invited me to present the Society's medals and awards. Time does not allow me to comment on the achievements of all the medallists and those who are to receive awards. But, on your behalf, I would like, most warmly, to congratulate them all.

Amongst the distinguished recipients this year are Dr. Somov, Mr. John Bartholomew and Professor William-Olsson. Dr. Somov has, I understand, played a leading part in the scientific exploration of the Polar regions and we must congratulate him for the research for which he has been responsible. We are delighted also to see Professor William-Olsson whose work is well known to everyone here. Mr. John Bartholomew very properly receives the Founder's Medal for his achievements in connection with *The Times* Atlas. His name has had world-wide associations with map making for very many years, and all of us must be glad to see his work recognized in this way.

Finally, I know that you will join me in thanking Lord Nathan for the great services he has rendered to the Society during his three years as our President. This, as many of you will know, is his last year of office, and throughout this time he has done much to encourage geographical research and exploration. To Lord Nathan, too, we owe a debt of gratitude for his encouragement of youthful activities in the field of exploration. It has always been the aim of this historic Society to encourage explorers and, as your Honorary President, may I send my best wishes to all those who in the forthcoming year will be engaged in exploration and scientific research."

Dr. E. W. H. BRIAULT, Hon. Secretary, read the Minutes of the Annual General Meeting held on 13 June 1960; these were confirmed, and signed by the President.

The President then delivered his Presidential Address, printed at pages 273–6.

The PRESIDENT: With Your Royal Highness's permission, I will now proceed to the citations for the Royal Medals and other Awards which Your Royal Highness is to present this afternoon.

The first of the two Royal Medals, the award of which has the approval of Her Majesty The Queen, our Patron, is the *Patron's Medal*. It is awarded this year to Dr. Mikhail M. Somov, Deputy Director of the Arctic and Antarctic Research Institute, Leningrad. Russian achievements in exploration, terrestrial and most recently celestial, have more than once made history. We as geographers are concerned with terrestrial exploration and it is in this context that we honour Dr. Somov. As a distinguished Polar scientist and a distinguished Polar explorer, he has added profoundly to our knowledge of both the Arctic and the Antarctic. The award of our Patron's Medal to him for these reasons is symbolic also of the high regard which we in this country, and in the Society, have for the great achievements of Soviet science.

Dr. MIKHAIL M. SOMOV: In receiving such a high award as the Patron's Medal, I cannot, indeed I would not wish to, hide the feelings of pride which fill me at this moment, inasmuch as similar awards were received by such great compatriots of mine as Semënov Tian Shansky, Colonel Przewalsky and Colonel Kozlov. I value this award not only as mine personally. The successes of research in Polar countries have been achieved, not only by a large group of Polar scientists working under difficult conditions in the Arctic and Antarctic, but also by many hundreds of people devoting their efforts to the preparation of expeditions and of their equipment. For us Soviet geographers the Royal Geographical Society has always been a scientific organization of the greatest authority, greatly respected throughout the whole world. Therefore, so high an award given by the Royal Geographical Society to the achievements of Soviet Polar scientists and geographers in the study of the nature of Polar countries cannot leave any one of them unmoved. Therefore, I beg you to receive deep gratitude for the high honour shown me today, not only from myself personally, but from the large group of Soviet Polar research workers putting in tireless work on the study of the Polar regions.

I would like to take this opportunity of making a small gift to the Royal Geographical Society of the entire published works of the Soviet Antarctic Expedition.

Captain Evgeniy IVANOV (Soviet Embassy): I am charged by the Soviet Ambassador, in his name and in the name of the Soviet Embassy, to offer deep gratitude for the high award given today to Soviet science, in the knowledge that this will do much to draw closer the ties of science between our countries.

Dr. Somov and Captain Ivanov spoke in Russian and Mr. R. A. French, of University College London, interpreted.

The PRESIDENT: On behalf of the Society I thank Professor Somov and gladly accept this splendid gift.

Our *Founder's Medal* this afternoon goes to an old friend and Life Fellow of the Society, Dr. John Bartholomew. The name of Bartholomew is enshrined in the history of British cartography and in the history of geographical progress in Britain. The father of our Founder's Medallist this afternoon won the Victoria Medal of this Society and was largely instrumental in establishing the Royal Scottish Geographical Society. Dr. John Bartholomew has added further lustre to this celebrated family tradition. He is himself a past President of the Royal Scottish Geographical Society. He has crowned a lifetime of distinguished service to cartography by his editorship and publication of *The Times* Atlas of the World—one of the great cartographical achievements of modern times.

Dr. JOHN BARTHOLOMEW: It is with the very deepest emotion that I receive this high award of the R.G.S., one which I would have never dreamt of in my most optimistic days. I joined this Society on the proposal of John Scott Keltie just after the First World War, in 1920. A map maker is in a sense a public servant trying to serve a very difficult and untidy world, whether it is in Sixes or Sevens! He tries to arrange it, at least on paper, into some semblance of tidiness, and it is a crowning encouragement that at the end of a life spent in such work the Society should think it worth while to

make such an award to me. To the President and Council of the Society I tender my humble thanks; to Her Majesty The Queen, who has graciously given her authority to make this a Royal Medal, I would, through Her Royal Highness, tender my loyal greetings; to Her Royal Highness herself, I would tender the most gracious thanks for the kind way she has bestowed it. To me it seems that Your Royal Highness comes like a fairy out of the Arabian Nights—Marina, Princess of the Sea—and I accept this medal very humbly and with very dutiful regards.

The PRESIDENT: We now come to the *Victoria Medal*. This has been awarded by the Council of the Society to Professor William William-Olsson, Professor of Economic Geography at the Stockholm School of Economics. Sweden has for long been to the fore in the application of geographical principles and techniques to urgent problems of economic planning. In this field, and in many allied branches of geography, Professor William-Olsson has rendered distinguished service to our subject.

Professor William WILLIAM-OLSSON: Thank you for this precious gift; I do not know what I have done to deserve it, but one thing I know is that I have had collaborators, people helping me at home and in England, and in other countries, and I would have liked, if it were not against the rules, to cut this medal into slices like a cake, and to give one piece to each of my collaborators! In Great Britain, the first piece would go to Professor Stamp. The geographers dealing with present-day economic conditions have tremendous competition with the interest aroused by daring explorations, by geomorphology and by historical geography. I can see here many prominent and famous representatives of these branches of geography, but I am glad that the Society has given at this time this medal for economic geography. I do not want to establish any competition—not at all—but on the other hand I feel for my own subject, not only that it is fascinating, but also that modern society will have great difficulty in adjusting itself to modern techniques without the aid of economics.

The PRESIDENT: I now turn to the Awards for 1961. First, the *Murchison Grant*: this is awarded to Professor K. M. Buchanan, of University College, Wellington, New Zealand, for his extensive contributions to the economic geography of many diverse regions—in the Midlands of this country, and in Africa. Professor Buchanan is unfortunately unable to come himself from New Zealand and the award will be received on his behalf by his mother, Mrs. S. Buchanan.

Mrs. Buchanan received the Award, and expressed her thanks.

The PRESIDENT: Next, though there is no formal order of priority among our Awards, comes the *Back Grant*. The recipient this year is Dr. Eric H. Brown of University College London, and it is awarded for his valuable researches in geomorphology, especially for his geomorphological studies in Wales.

Dr. Eric H. BROWN: Little research is the product of unaided work and I have received more than my fair share of help and encouragement from many sources. Three take pride of place today: my geomorphological touchstone, Professor Wooldridge and the heads of the two departments of geography in which I have taught—first, Professor Bowen at Aberystwyth and now Professor Darby at University College. If in my narrow field I have managed to climb to a modest height I have done so only on the backs of a long line of worthy predecessors, from Ramsay in the 1840's to Professor O. T. Jones of the present day. Admiral Sir George Back, R.N., was an Arctic explorer, and as the Back Grant has frequently been awarded to a naval recipient there would seem to be no justification for its award to me—an ex-R.A.F.V.R. pilot. The fact is, however, that the first professor of geography in Britain was also a naval officer, who held his chair at University College London; I refer, of course, to Captain Alexander Maconochie, R.N. (also the first Secretary of this Society) and, whether or not this connection is a sufficient reason for my receiving the Back Grant, I should like to thank the Society most sincerely for honouring me in this way.

The PRESIDENT: The *Cuthbert Peek Grant* for 1961 is awarded to Dr. Martin Holdgate, leader of the very successful Royal Society Expedition to Southern Chile of 1958–9. Dr. Holdgate is a zoologist and at present Assistant Director of Research

at the Scott Polar Research Institute, Cambridge. The grant is to encourage him to further expedition work in the near future, in his chosen field.

Dr. Martin W. HOLDGATE: Whilst feeling deeply honoured at receiving this award today, I must confess to feeling slightly guilty and distinctly inadequate; slightly guilty, because it has often seemed to me that awards of this kind were designed to encourage and reward long periods of devoted academic labour and I enjoyed myself in Chile far too much to need any added encouragement. I feel inadequate for a reason which many speakers have touched on—namely, that expeditions today are not one-man affairs, and if in Chile we were able to add anything to geographical knowledge, it was because of the combined work of our entire party, and of our many helpers in the Royal Society which sponsored the expedition, and also of our friends and hosts in Chile—a country which, as Your Royal Highness knows, has a great tradition of warm hospitality to visitors.

I hope I am right, Sir, in interpreting this award as a recognition from the Society of what our entire party was able to achieve in Chile. I know that it will be appreciated by them all, and also by our expedition committee in the Royal Society, a body long joined with this one in devotion to the improvement of natural knowledge.

The PRESIDENT: Dr. C. A. M. King, of Nottingham University, wins the *Gill Memorial* for important studies in the glaciology of Iceland and Arctic Norway, and for much valuable work in the morphology of coasts and beaches. She too, we hope, will be encouraged to further work in these branches of geography.

Dr. Cuchlaine A. M. KING: I am deeply grateful for the honour done me by the President and Council of the R.G.S. in making me this award. It is a great encouragement and will stimulate me to continue the study of some of the intriguing problems which still await solution. Such work usually requires a team of willing helpers and I feel that this award should really be shared by all of those with whom I worked in the field, whether on the beach or on the glacier. I also owe a great debt of gratitude to those who aroused my interest in these fields, particularly to Professor Debenham and to Professor Steers, to Miss Mitchell and to Mr. Williams, who fostered and encouraged my studies, and to my colleagues at Nottingham with whom I have continued them. I have also received much help from many other sources and I would like particularly to mention Mr. Lewis whose tragic death is such a loss to geographers everywhere; and also Mr. Ward who organized the Norwegian glaciological investigations in which I was privileged to take part. To be a geomorphologist is indeed fortunate, as one is able to work in such exciting surroundings as the seaside and the snowy mountains; and, as if this was not enough, to be rewarded for the work in so pleasant a fashion!

The PRESIDENT: Finally, we come to the *Mrs. Patrick Ness Award*, shared jointly this year by Mr. R. M. L. Mason and Mr. A. R. Hanbury-Tenison. They received it for their very enterprising and adventurous pioneer journey of 6000 miles by jeep across South America, completed in 1959. This revealed many remarkable blanks and errors in existing maps and opened the way for further detailed exploration. Mr. Mason is at present exploring in the extreme north of Brazil; his partner in adventure, Mr. Hanbury-Tenison, will therefore receive the award on their joint behalf.

Mr. A. R. HANBURY-TENISON: As the last, and certainly the least distinguished, of those to receive awards this afternoon, I shall confine myself to trying to express my very great thanks and gratitude. First of all, to My Lord President and Council of the R.G.S. for giving us this award, and secondly to Your Royal Highness for presenting me with it. I have myself retired from exploring, but my co-recipient Richard Mason is at present in Brazil and I am sure he would like me to take this opportunity to thank the R.G.S. on his behalf for the enormous help they have given him on his present expedition.

At the conclusion of the presentations, Lord RENNELL proposed and Sir JAMES MARSHALL-CORNWALL seconded the adoption of the Annual Report and Accounts,

previously circulated. Mr. Pirie-Gordon, Honorary Treasurer, spoke briefly in explanation of the accounts.

Sir RAYMOND PRIESTLEY: I understand that I am going to take office as President at the close of the Annual Dinner. I feel that my first duty will be to ask you to thank Lord Nathan for his outstanding services during the last three years. As I am sure I am going to realize more and more, the post of President of the Royal Geographical Society is no sinecure. We are much indebted to both Lord and Lady Nathan for the hospitable manner in which our visitors have been entertained during his term of office: my Lord President, and Lady, we thank you for three years of stewardship of our affairs.

Mr. HAROLD GOULD and Mr. G. J. BOND acted as scrutineers of the Ballot for elections to the Council, and it was announced at the close of the meeting that all candidates proposed for the Council as Officers for the ensuing year had been elected.

THE ANNUAL DINNER

The Annual Dinner of the Society was held at the Dorchester Hotel on 19 June 1961. Lord Nathan, President of the Society, and Lady Nathan received the company of 420. Viscount Hailsham, Lord President of the Council and Minister for Science and Technology, accompanied by Lady Hailsham, was principal guest. The Toast of the Society was proposed by Lord Hailsham, with reply by the President. The Toast of the Guests and Medallists was proposed by Professor L. Dudley Stamp with replies by the Lord Mayor of London, Sir Bernard Waley-Cohen, for the Guests, and by Dr. Mikhail Somov (Patron's Medallist) and Dr. John Bartholomew (Founder's Medallist) for the Medallists. Other guests were the Lady Mayoress, The Hon. Lady Waley-Cohen, the Mayor and Mayoress of the City of Westminster, the Danish Ambassador and Madame de Steensen-Leth, the Peruvian Ambassador and Madame de Rivera Schreiber, the Chilean Ambassador and Madame de Santa-Cruz, the Polish Ambassador and Madame Rodzinski, the High Commissioner for New Zealand and Mrs. Macdonald, Professor W. William-Olsson (Victoria Medallist), Mrs. John Bartholomew and the recipients of Awards and their wives.

After Grace by the Reverend Gregory Hopper the President read the telegrams exchanged between the Society and Her Majesty The Queen:—

As President Royal Geographical Society and on behalf of Council Fellows and Members assembled today for Anniversary Meeting presentation Royal Medals and Annual Dinner, I beg leave to offer to Your Majesty our Patron loyal greetings and respectful affection.
NATHAN

Please convey to the Council Fellows and Members assembled today my warm thanks for their message of kind and loyal greetings which I as Patron greatly appreciate.
ELIZABETH R.

After dinner the Loyal Toasts were proposed by the President and duly honoured. The Toast of the Society was proposed by the Rt. Hon. Lord Hailsham, Lord President of the Council and Minister for Science and Technology.

Lord HAILSHAM: I rise to propose the toast of the Society, a toast which, if it is not supported by too lengthy a speech, should receive unanimous approval in this company. I asked you, my Lord, what to say, and you were helpful, if negative. You gave me one piece of advice, which was this: I was not, you said, to spend time in recounting the history of your Society, or in congratulating your Society upon the ripe age it had attained. That means, I suppose, that I should say nothing about your pre-Victorian descent, your tally of Fellows (exceeding, I believe, 7000 in number) spread across the continents; your publications and your striking collections of books and maps; the list of expeditions and research that you have sponsored; the distinguished membership of your Council. Last but not least, I should say nothing about the public and private virtues of your President. On the whole I decided to take all this advice, but I can do

so only at the price of being largely irrelevant and giving vent to a number of opinions and sentiments which have only marginally to do with the subject in hand. My Lord, I commend your Society first because it illustrates the relationship between science and adventure. Scientific adventure can, of course, be simply a voyage of the intellect, an explanation of statistics or minute particles, a pioneering on the frontiers of knowledge. Like badminton or chess, most people, I suppose, would regard science as an indoor sport, but if so they would be wrong. Science is, or at least can be, very much an open-air life; in point of fact, it has always been so and the great scientists of the past have often been indefatigable travellers—Darwin not least; while the travellers and explorers have fortunately often been keen scientists as well. My first and only contact with your Society before tonight demonstrates this particularly well: I was on the Committee of the Alpine Club at the time when your Society was organizing the Everest Expedition.

But, my Lord, and this is the second point I want to touch, is geography a science? In the dramatic schizophrenia of the alleged two cultures of which Sir Charles Snow is so conscious today, on which side of the barricades do the geographers stand? The answer is a peculiar one, for they stand on both sides of the barricade. It depends on how you teach geography—and what you learn. In some universities geography is taught as a science, in others as an arts subject. Which is right? The answer is neither and both. So the question I want to raise is, are there in fact two cultures or only one? Is Sir Charles Snow's diagnosis a reflection of life on this planet—or in this country—or is it just a reflection of Senior Common Room politics? And if, as I suspect, it is the latter, had we better not start forgetting it? Is anthropology a science or a humanity? Was Michael Ventris's decipherment of the Linear B script of the Mycenean civilization as Greek a literary or a scientific achievement? Was the application of the Carbon 14 technique to the Dead Sea scrolls a piece of historical or scientific research? Is the statistical analysis of style in the Biblical manuscripts science or divinity?

On a more fundamental level, can a sense of pure intuition be divorced from any genuinely scientific enquiry? Is not the possession of this precisely the factor which in any walk of life distinguishes the genius from the second-rate enquirer? The truth is that any educated man today is in some degree a specialist, and few of us understand one another's specialities. But that is not to say there are two cultures or many. It simply means that, of the highly complex culture of which we are all part, each of us can understand in any detail only small areas of the immensely complicated whole. No, my Lord, the "two cultures" is a myth of the Senior Common Room, but it is a myth which reflects the highly artificial structure of our university courses and this is where I return to geography as a subject. The myth of the two cultures can exist only in an academic society where insufficient attention is being paid to the vast range of subjects which bridge the gap between the academic sciences and the academic humanities; not only geography, but also the other human sciences, economics for example, management studies and possibly also the more academic and philosophical aspects of law. If this is so, is there not scope for evidence to be given to the committee now sitting on advanced education about the place of geography, about the place of human sciences in an university curriculum—and, in particular, in the curricula of the new universities which are about to be founded. In the meantime, my Lord, I have kept your precept. I have spoken in terms which do not traverse your Society's history or its venerable traditions. In addition to its other virtues I commend two particularly: its continued support of exploration, which is one of the many links between science and adventure, and its pursuit of a study which, if it is true to its own genius, must prove that the diversity of the two cultures is a fond thing vainly imagined, and that the arts and sciences are truly and should remain part of a single complex whole.

But if I may not speak of the past, what of the future? In every generation it must, I suppose, have seemed that the great age of geography was coming to an end; so it must have seemed to the ancient Phoenicians when they had discovered and settled Carthage, when they had passed the Straits of Gibraltar and when they had finally come here to the "Islands of Tin". So it must have seemed, too, when Alexander

crossed into India or the Arabs crossed the ocean to Ceylon, Malaya or even China; when the Vikings found out Greenland, or even that strange Land of Vines which I find it hard to associate with the United States of America; when our ancestors circumnavigated the globe, and when they discovered Australia and New Zealand; when Stanley, Livingstone, Speke and Grant crossed the interior of Africa or discovered the sources of the Nile; or even more recently, in our own lifetime, when Scott and Shackleton reached the vicinity of the South Pole. In each case the illusion was that the challenge and the romance had gone out of exploration, that geography had become the art of making maps and nothing else.

But there is always something else: to the questing spirit of exploring man Everest is always there, and the Everests of the future remain unconquered still. The study of the earth is always acquiring a new significance and perhaps never more than now, as it dwindles in size, down to the proportions of the smaller planet of an average sun in a minor galaxy. So its heights, its depths, its ocean floor, its ice cap, its mantle, its Mohorovič layer, its core, its atmosphere, its magnetic field, the charged particles which surround it and the space beyond begin slowly to come within reach. In its new and wider sense geography is only just beginning, and with that thought I give you the toast of the Royal Geographical Society.

The PRESIDENT (The Rt. Hon. Lord NATHAN): I must say to Lord Hailsham that, as I listened to him this evening, I thought how sound my advice had been, and I thought also what a compliment it was to us, not merely that he should have come here as our guest—after all, he is Lord President of the Council and Minister for Science—but that he should have taken the trouble and done the work which must have been involved in that brilliant speech. It is pretty easy when you are asked to address an organization to look through its history, to look at its recent record, and then to address yourself to the subject by putting a few facts together. It is simple for the speaker and not very interesting for the audience, for few of us wish to have recorded back to us our own history. But to make a speech for an occasion in the way in which quite clearly Lord Hailsham has done is to do a piece of work worth doing, as the result shows, and I regard it as a special compliment to the Royal Geographical Society that, busy as he is, he should have done this for us.

I must say that I did observe, broadly speaking, that Lord Hailsham was interrogative rather than positive. It is always entertaining to have the questions asked, if you know that your listeners have neither seen the questions nor are competent to answer them. I would only say, with regard to whether we are on one side of the barricade or the other—he seemed to think we are on both—a difficult exercise—that I think the answer is, we are on both sides of the barricade. Lord Hailsham queried, as many have done, whether and how far geography is a science. Most people think of us in the Royal Geographical Society not as scientists but as explorers, or at least as sponsors of exploration. That is right. Exploration has indeed been our principal mission ever since our foundation one hundred and thirty-one years ago. It is our principal mission today. During the past three years during which I have had the honour to be President, we have supported over one hundred expeditions to many different parts of the world. Fifty of these—a record number—will leave the country this summer. These are not great national expeditions such as those to Everest and the Antarctic which we have helped to launch since the War. They are expeditions of young people, mostly from the universities. We support them to give them training in scientific work in the often arduous conditions of the field. We support them because it is part of our mission—in my view a most important part—to encourage in this way the spirit of initiative and enterprise and adventure among the young. This year, largely due to the generosity of the Wolfson Foundation, we have been able to do this on a greater range and scale than ever before. For the first time, we have helped to launch expeditions which include young apprentices and technologists from industry. I am sure that this quite new movement will spread. I am also sure that there can be no better way of broadening the outlook of these young people or of stimulating them to adventurous progress in applying their technical skills. Another new departure has been the award

of four bursaries to schoolboys selected by the British Schools Exploring Society for their annual expedition. We have also this year, when an emergent Africa is so much in world news, helped to launch the first all-African students' expedition from Makerere College, Uganda.

When I talk of exploration, of course, I mean land, or even underwater, exploration. So far, unlike Major Gagarin,

> (Our) "soul Proud Science never taught to stray
> Far as the Solar Walk, or Milky Way".

But that is not to say that we have no concern with space exploration. Certainly we are a Geographical Society; but as space research adds to our knowledge of the configuration and measurement of the Earth, then we too will enter the Space Age.

But exploration is not our only mission in life. We have another and allied mission—to advance the science of geography, and to forward the study of it as an academic subject. I think I can say that we have had some success in this. There are now departments in all our universities. With our encouragement and advice, geography will soon have its share in the new universities which are springing up so rapidly in this country.

Geography as a science has a twofold, or even threefold, allegiance. It is allied to the physical and biological sciences. These are Lord Hailsham's special preserve. It would be unwise, if not unsafe, for me to say anything about them tonight! But geography also has its part in the social sciences. Now the social sciences are very much of a poor relation in Britain today. They have no eloquent and powerful sponsors, Lord Hailsham, like the physical and biological sciences! Though we are in the throes of social and economic changes of great consequence to the social scientist, there is no central body such as a "Social Sciences Research Council" to coordinate them and apply the fruits of their research to current problems.

We have had experience of one such problem in the Royal Geographical Society of recent months. This is in connection with the urgent need for geographical information—geographical "intelligence" one might call it—for use in our social and economic planning. We know that the planning ministries and the local planning authorities need this, constantly available and up to date. They have not the staffs to assemble and analyse it themselves. In a Communist country—as I am sure our distinguished guest from the Soviet Union would agree—this would be the constant task of a State organization, of the Geographical Institute of the national Academy of Sciences. I saw some remarkable examples of this during a recent visit to the Academy of Sciences in Poland. In this country there is no such institute. Could, then, our university geographers provide it, within the framework of normal academic research? There is, I think, little doubt that they could. But the universities, we discovered, had little knowledge of what our physical planners required. Nor do our planners fully know what our university geographers can provide.

I will give you an example of the magnitude of the planning problem—the situation in south-east England. In the next twenty years, the population of south-east England will increase by at least two million people. To plan for this requires a mass of geographical information—about the density of dwellings, about the movement of people, about patterns of commuting to and from our cities, and about the possibility of decentralization from those cities—above all, my Lord Mayor, from this great City of London. As I say, I am sure that our university geographers could assemble and analyse and map this kind of information. But first we need to bridge this gap between the universities and the planning authorities. We ourselves are now trying to do this in our own particular field. In default of any official committee or organization, it seems to me proper that we, a private society with the status of a national institution, should try and help in an urgent national problem such as this.

I mention this because it is an example of the way in which a private society like ours can make its contribution to the national welfare. It is indeed one of the many ways in which we do so. Through our sponsorship of exploration, as in the case of the Everest

expedition, we have won prestige for the nation. Through our support of youthful expeditions we provide a centre and source of inspiration and initiative for the young people of this country. We maintain, largely at our own cost, a public Map Room and geographical information service. We are unique in this. Finally through our research publications and our working committees and our lectures we make our contribution to the scientific and educational life of the country.

Looking back over my past three years as your President, I think I can say that we have made very substantial progress in all these directions. And we have done this despite the great financial difficulties in which all learned societies find themselves today. Finance, or lack of it, is indeed the only grave obstacle to our further progress. But I will not dwell on this darker side of geography. I prefer to look forward, with all the optimism which Lord Hailsham has so characteristically displayed, to our future prosperity. In doing so, I thank him once again for a toast which has given us all very great pleasure this evening.

Professor L. DUDLEY STAMP: I rise with very great pleasure to propose the toast of our guests and Medallists. It is a very special, an almost rare, occasion when we have present our three Gold Medallists. We accord a special welcome to all three of them, who have travelled considerable distances to be with us at our meeting this afternoon and at our dinner this evening. I refer first to Dr. Mikhail Somov, Deputy Director of the Arctic and Antarctic Research Institute, Leningrad. Here we have the supreme example which our President has just referred to, of the real explorer and discoverer of today, when the old exploration is giving way to the new, which means an intensely scientific study of the countries which are visited. We have moved quite a long way from the days of old, when the definition of an explorer and of discovery was "the first sight of a foreign country by a Britisher (preferably an Englishman) but not genuine unless sponsored by the Royal Geographical Society". Exploration today means more than that, and it is with great pleasure that we welcome our distinguished Medallist and guest from the U.S.S.R.

Then I turn to our second Medallist whose name is a household word, not only wherever geographers are to be found but wherever there is a map being used. He is Dr. John Bartholomew of the Edinburgh Geographical Institute. I should refer to him, I think, as John Bartholomew the Fifth, and his son John Bartholomew the Sixth is also here; the family has been playing about with maps for 160 odd years. Many of us remember how, after the First World War, the House of Bartholomew produced *The Times* Atlas, with dotted lines where it was hoped boundaries between countries would lie. Now in this mid-century they celebrated last year the completion of that magnificent work, far more than just a compilation of maps, a work of real research—the new *Times* Atlas, and let us congratulate our Medallist at the same time on a stupendous work appreciated by the whole world.

It is a very special pleasure for me to have at my table my good friend Professor William William-Olsson, of the Stockholm School of Economics, which stands throughout the world for that development, Mr. President, to which you referred—the development of applied geography. We identify Professor William-Olsson with this influence, through that school, and throughout the world, in furthering economics and social and human geography in a variety of fields. Professor Olsson, it is delightful to have you with us this evening and, of course, we claim your brother through our B.B.C., and his wife, as ours, as much as yours in Sweden.

Professor Stamp then welcomed the recipients of Awards and went on to say:—

It is difficult for me at this stage not to embark on a long argument with the Lord President of the Council, Lord Hailsham. Now, if we had specially arranged it for your benefit tonight, we could not have done better in selecting our three Gold Medallists. Because they do represent geography: they represent the modern scientific exploration of the far distant areas and they represent also what must be done with the material in its very careful translation, particularly in the form of maps, before it can be really used in another stage. What is the use of geography which leaves off there, until it comes to its application to the betterment of mankind, which I suggest is

represented by our third Gold Medallist, Professor William-Olsson. What we are worried about is whether Lord Hailsham is responsible for us or not? He shakes his head vigorously! There is no barrier in geography—that is really the important thing of the day, and I think my professional colleagues in this room will bear with me when I say that science, art and philosophy are an indivisible whole, the relationship between man and his environment. Lord Hailsham will say, as will the Fellows of the Royal Society, so long as you keep "pure" and keep on the physical side of geography, and do not let yourself be polluted by anything to do with human beings, we will accept you as a science. But we cannot bear in these days to have that dichotomy, and I suppose we all hope the D.S.I.R. will view in its grants the whole of geography and not just the physical side, and that we may come under your umbrella, Lord Hailsham.

Professor Stamp concluded by welcoming ambassadors and their ladies: the Danish, Peruvian, Chilean and Polish, the Lord Mayor of London and the Lady Mayoress; the Mayor and Mayoress of Westminster.

The LORD MAYOR OF LONDON (The Rt. Hon. Sir Bernard WALEY-COHEN): In thanking the last speaker I feel that I am really the representative of one of those essential units in the field of geography—the Common Man. We have heard three brilliant and erudite speeches and we are to hear two more by gentlemen who tonight go by the grand title of First Gold Medallists, and therefore the odd man out must indeed be the Common Man, representing the common guest, and I feel a little bit at sea in talking for all these guests of distinction (and, like myself, otherwise).

We have heard so much about geography being the Cinderella of education that you might think it was not a subject at all, either at Ordinary Level or at Advanced, in that examination which everyone has to take. I have made some enquiries as to the part which that part of the University of London with which I am associated has played in the development of this Cinderella—I mean, University College London. I find that although it is generally thought (indeed it appears in Ministry of Education pamphlets) that the first departments and chairs of geography were founded at Oxford and Cambridge towards the end of the nineteenth century, in fact, University College was miles ahead and had a figure called Captain Alexander Maconochie, who was appointed a professor of geography as long ago as 1833. Let me hasten to add that when Maconochie retired in 1836 to take up a post on the staff of the Governor of Van Diemen's Land no successor was appointed until 1903. So whilst the claims of Oxford and Cambridge go by the board, nevertheless, University College having inaugurated the conception that geography was a subject for which there might be a professor, retired from the fray for some seventy years (or nearly so). Since then University College has developed very much its geographical department and now has a live and active department with an emphasis on physical geography, including climatology, as well as historical geography and economic geography.

It seems to me that research as well as teaching of geography should really have a much stronger historical emphasis, in the belief that an understanding of the present geography of an area can be obtained only by a knowledge of how it has come into being. Here again University College is rather in the forefront because they are now engaged in the reconstruction of the geography of England in the eleventh century, based upon the Domesday Book. Believe it or not, the Domesday Book is being so explored that the Cambridge University Press has commissioned a publication about it which is to run to no less than seven volumes. To us laymen this does indeed seem phenomenal and we can only hope that the reviews will be such that those of us who are real laymen will not need to wade through these monumental documents.

As Lord Mayor of London I am going shortly on a great tour to distant parts where I have not been before. I am going to Australia, New Zealand and also to Hong Kong, Bangkok, Kuala Lumpur, Singapore and Rangoon. One of the things that is going to fascinate me is to find out to what extent I was taught inaccurately when at school! Lord Mayors of London these days go visiting abroad to all sorts of places and it is, I think, in the same spirit of trying to find out, not only what the physical shape is of the countries which they visit but also the kind of people and the kind of way of life. It

seems to me that if, as these erudite speakers have told us, there seems to be no particular niche or home in the academic world for geography, it is really because it covers so all-embracing and wide a sphere that it knows no limits. At least those of us who are completely lay and read the list of what the Medallists are being given these awards for tonight, might well think that there seems no limit to the variety of things which come within this heading. In the name of all your guests other than the distinguished First Gold Medallists, who yet have to speak, I thank the President and Fellows of the Royal Geographical Society for their exceedingly kind and generous hospitality to us tonight.

Dr. Mikhail SOMOV (*interpreted by R. A. French*): Unfortunately as I do not speak English I must address myself to you indirectly; and, having reached that dangerous age when having started to speak I forget when to stop, in order not to try your patience I have in advance put down what I wish to say on paper.

First I would like to thank the R.G.S. for the warm hospitality it has shown me here in London. The Antarctic, and especially the great ice continent which lies at its heart, is distinguished from all other regions of our planet (including even the Arctic) by a whole series of peculiarities which are found only in the Antarctic. It is today widely known that the Antarctic continent is distinguished by the most severe climate of the earth, that the temperature of the air in its central areas falls even to minus 90° C, and that at such temperatures ordinary steel can become as brittle as glass and that ordinary petrol can extinguish fire like water. It is known, too, that in the scientific stations in the centre of the continent, situated at a height of 3000–4000 metres above the level of the sea, conditions for the life and work of man remind us, in their difficulties, of those conditions relating to the presence of man in space. It is known, too, that the central part of the Antarctic continent is also the largest region of the world which is in fact devoid of organic life, and the only region on the planet where no single living thing except man can acclimatize itself to these severe conditions. But man has acclimatized himself, and lives in the very centre of the Antarctic continent and by this very fact stresses beyond argument his right to be called the "King of Nature".

Besides these generally known characteristics of the Antarctic continent there are also a whole series of little known, indeed little noticed, peculiarities which make this continent particular, peculiar, distinguished from all other continents. For example, there are few who know (and even if they do know have thought little about it) that the Antarctic continent is the only one on our planet which is an entirely male continent, that only men live there, completely freed from restrictions on the part of the ladies, and therefore highly suitable for them to give themselves to their work in a greater degree than in any other part of the world. Indeed, nobody at any time has thought about the fact that the Antarctic continent is principally distinguished from the remaining continents by the supremely undeviating fidelity of all the men who live there to their wives and sweethearts, and that from the Antarctic continent goes out through the ether to the wives and sweethearts the most longing, the most warm, telegrams in the world with words of love and respect.

It would be possible to carry on endlessly the list of the various peculiarities of the Antarctic continent which give it a special position before all other regions of our planet. But there is one peculiarity of the Antarctic continent of which I would like to speak to you. A hundred and forty-one years ago mankind did not even know of the existence of this continent, it is not yet sixty-five years ago when this continent was first known to man, and now it has, literally before our eyes, become a continent giving the finest and the supreme example to all remaining continents of the progress of mankind. The remarkable cooperation of scientists of various countries operating in the Antarctic during the period of the International Geophysical Year has not only not weakened since the end of the year but on the contrary has developed and widened in the succeeding years. The Washington Treaty on Antarctica, ratified now by all the countries which signed it, has opened new and finer perspectives for the development of scientific investigations in Antarctica, by the united forces of scientists of all countries. This treaty has made the Antarctic continent the first, and at present the only,

continent of peace in our world. On it not only is war forbidden but also the preparations and the measures for war; is not this indeed remarkable? Therefore, I would envisage a toast that the spirit of warm cooperation between scientists of various countries and effective measures for the prevention of the danger of war which have taken place on the ice of the Antarctic continent can spread in the immediate future to all the remaining continents of our planet.

Dr. John BARTHOLOMEW: My position as last on the toast list makes my task all the easier. There have been so many wise and far-reaching things said about the science of geography that there is little at this hour I can add to it. Whether you call geography a science or an art, it is one of the most potent and live subjects which can help the nations of this world towards a better mutual understanding and sense of confidence. In that I support the words of Dr. Mikhail Somov in his interesting disquisition upon the Antarctic. Personally, I would be very surprised if within the next ten years or so you do not find advertised in our Christmas newspapers the new Christmas Hotel at the South Pole which will give unrivalled facilities to Father Christmas—and to ladies as well as gentlemen, without which indeed it would be a very poor thing! That, and the possibility of nuclear travel (which I do not think will come as quickly as some people imagine), hold out interesting problems for the future awards of the R.G.S.; because if we are to restrict the awards to work done on this *terra firma* the numbers of new continents on new planets to be discovered do not qualify under this Society's awards.

Well, Mr. President, I do not wish to be a burden on this delightful dinner any further, and would like, on behalf of the Medallists, to thank you and your Council for the hospitable way in which you have entertained us this evening.

The PRESIDENT: It is a wise convention of the R.G.S. that, although it elects a President each year, no President shall accept the Presidency after having served for three years—even if offered. We have also a convention that at the end of his third year his term of office expires at the conclusion of the annual banquet. Now the annual banquet is concluded, my term of office has come to an end and I have the agreeable duty of investing my successor with the badge of the office of President of this Society.

I stand by his side—he is Sir Raymond Priestley, well known in the world of science, learning, geography and exploration. He has been Vice-Chancellor of two universities (one in Australia, one in this country), he has been President of the British Association for the Advancement of Science. He went to the Antarctic two or three years ago accompanying Prince Philip, but perhaps most distinguished of all, he is the only man now living who carries and wears today before you both the Scott and the Shackleton medals. In such a successor, I feel that I myself have cause to be proud and the Society to be fortunate. I now have pleasure in investing Sir Raymond Priestley with the Presidential Badge.

Sir Raymond PRIESTLEY: What can I say? Simply this: I am very sensible of the honour you have done me and I will do my best not to let you down.